1995
STATE RESPONSE

DOCUMENTS 42-46

KALAMAZOO RIVER

SITE

INVESTIGATION

DOCUMENTS #42 - 46

CHIPYARD OIL INVESTIGATIONS

DOCUMENT #42

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MEN01679

STS Consultants Ltd.

Consulting Engineers

Report

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

June 12, 1986

Mr. John Blauwkamp, P.E.
Corporate Environmental Manager
Menasha Corporation
320 N. Farmer St., P.O. Box 155
Otsego, MI 49078-0155

RE: Otsego Paperboard plant Hydraulic Oil Spill -
HYDROGEOLOGIC ANALYSIS REPORT

Dear Mr. Blauwkamp:

Enclosed is a hydrogeologic analysis report for the Otsego Paperboard Plant in Otsego, Michigan. This report was prepared by STS Consultants, Ltd. under agreement of Menasha Corporation Purchase Order No. 4800263, dated January 31, 1986.

The objective of this study was to investigate possible soil and groundwater contamination by hydraulic oil. The site is located on the north side of the Paperboard Plant and under the chip conveyor in the wood yard. Specifically, this study included the performance of soil borings, installation of monitoring wells, soil and groundwater sampling and analysis, conceptual development of remedial actions, and preparation of an engineering report.

This report is submitted in draft form for your review. If you have any questions regarding the enclosed document, please feel free to contact us.

Sincerely,

STS CONSULTANTS, LTD.

Bernard B. Sheff, EIT
Assistant Project Engineer

Timothy K. Dahlstrand, P.E.
Vice President

BBS/lch

STS Project No. 1073

MEN01681

Report

Project

OTSEGO PAPERBOARD PLANT
HYDRAULIC OIL SPILL
HYDROGEOLOGIC ANALYSIS REPORT

Client

MR. JOHN BLAUWKAMP, P.E.
CORPORATE ENVIRONMENTAL MANAGER
MENASHA CORPORATION
320 NORTH FARMER STREET
P.O. BOX 155
OTSEGO, MI 49078-0155

Project # 1073

Date JUNE 12, 1986

STS Consultants Ltd.
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3340 Ranger Road
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1.0 INTRODUCTION

The Menasha Corporation owns and operates a paperboard plant in Otsego, Michigan. A hydraulically operated conveyor for unloading wood chips was installed in 1981 in the chip yard. Hydraulic oil losses from the conveyor have occurred since its installation. A review of oil purchase records from 1981 through the present suggests that 5,000 gallons or more of hydraulic oil may have been lost. It appears that the oil leaks discharge to the ground surface. A vicinity map of the project site noting the approximate location of the oil spill is shown on Figure 1.

The objective of this study was to assess the soil and groundwater contamination at the site. Specifically, this would include estimation of vertical and horizontal extent of contamination, and possible methods of remediation of the site.

The purpose of this report is to present the results of the hydrogeologic analysis performed, and remedial action alternatives. The scope of this project included the following:

A. Reconnaissance - Collect all available information regarding the geology and past history of the site.

B. Subsurface Explorations - Perform soil borings and install monitoring wells to classify the subsurface soil conditions, identify groundwater elevations, and sample groundwater at the project site. Several geophysical techniques were also utilized in an attempt to estimate the horizontal extent of contamination.

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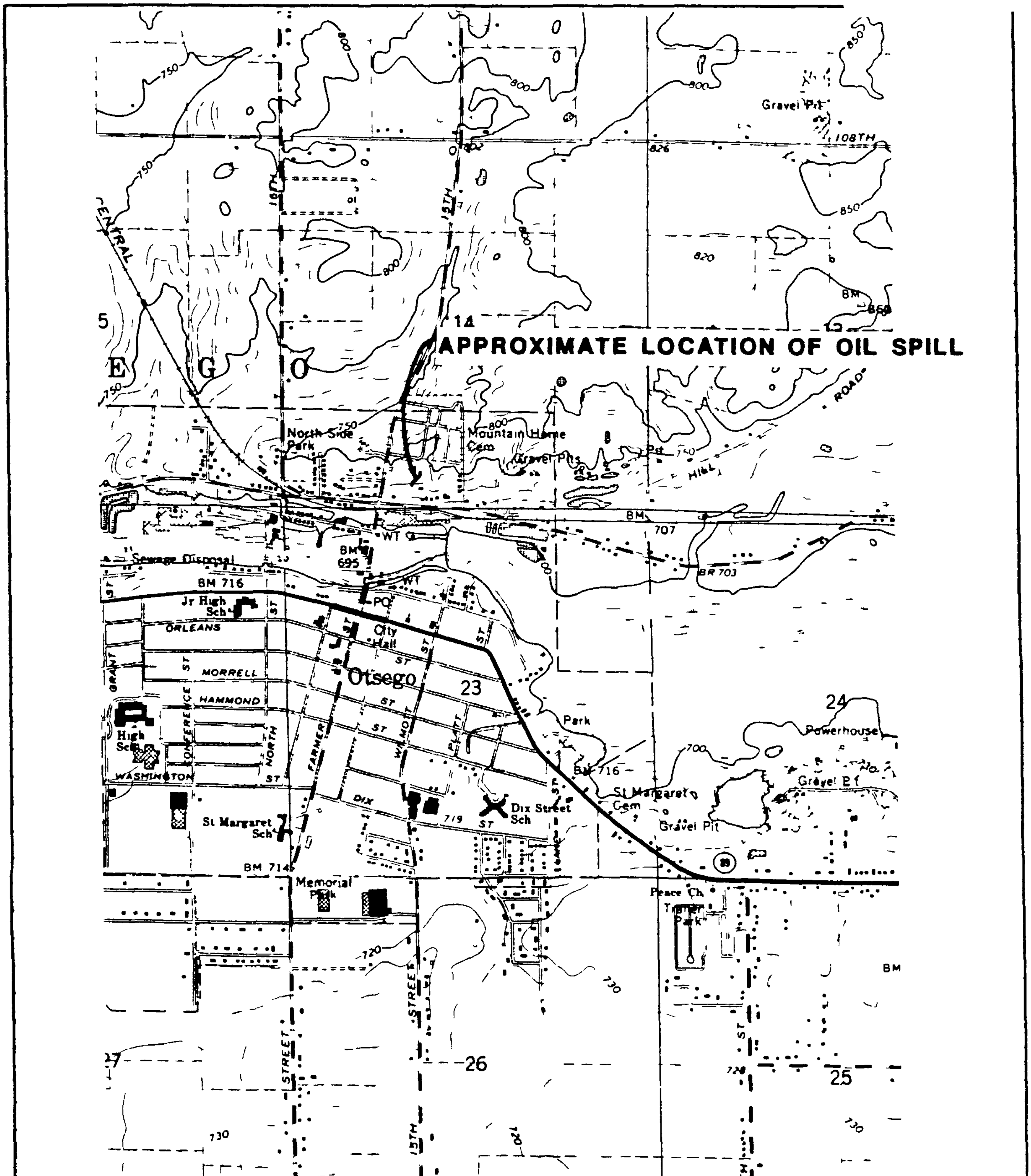


STS Consultants Ltd. FIGURE SHEET	PROJECT **MENASHA CORPORATION HYDRAULIC OIL SPILL INVESTIGATION**	FIGURE NO 1
	TITLE **LOCATION MAP**	JOB NO 177 P

DATE	DRAWN BY	APPROVED BY	SCALE
1-6-88	CJD	TKD	1"=2000'

C. Assessment of Hydrogeologic Conditions - Estimate groundwater flow directions, groundwater quality, and estimate, if possible, limits of soil and groundwater contamination.

D. Conceptual Development of Remedial Actions - Develop several possible remedial alternatives to reclaim the groundwater aquifer which had been contaminated.

2.Ø ANALYSIS OF DATA BASE

As part of this study, site reconnaissance was performed to develop a better understanding of the area surrounding the Menasha Paperboard Plant. This included review of previous geotechnical and environmental studies performed at the site, and well driller's logs for the plant water supply wells.

2.1 Previous Geotechnical and Environmental Studies

In recent years, a number of geotechnical and environmental studies were performed by STS Consultants for the Menasha Paperboard Plant. Specifically, these studies have developed a general understanding of the project site with regard to major soil types and stratigraphy. The previous studies include:

- Geotechnical analysis for the Spent Liquor/Sludge Storage Facility in 1981 (Reference 1).
- Site development plans, design of liners for lagoons, and construction testing in 1982 (Reference 2).
- Hydrogeologic report for new tank and sludge pond in 1982 (Reference 3).
- Closure plans for sludge landfill in 1982 (Reference 4).

These reports indicate that the predominant soil types will be granular fluvial outwash, with stringers of fine grained soil.

2.2 Existing Production Well Information

Well and pump service inspection reports for Menasha production wells #5 and #4 were collected and reviewed as part of this study. The inspection records are included in appendix A.

Well #5 was drilled in 1970. The well is 76 feet deep and has a gravel pack with a 12 inch diameter, and 15 inch screen. The well was last tested on February 3, 1984. At that time, the well produced 257 gpm with 39 feet of drawdown and a total dynamic head of 302 feet. The zone of influence of this well is estimated at 300 feet by the Menasha Engineering Department.

Well #4 was drilled in 1967. This well is 87 feet deep with a gravel pack approximately 12 inches in diameter with a 25 inch screen. The well was last tested on February 3, 1984. This well produced 273 gpm with 37 feet of drawdown and a total dynamic head of 294 feet. The zone of influence of this well is estimated at 300 feet by the Menasha Engineering Department.

Well #5, which lies approximately 570 feet south of the chip conveyor, is the closest well to the chip conveyor. Therefore, this well has the greatest possibility of impacting the water levels about the chip conveyor. As stated above, the zone of influence of this well was estimated at approximately 300 feet. However, this is based on simplified geologic model and does not take into account the Kalamazoo River. It is possible that the drawdown from Well #5 does reach to the chip conveyor.

3.0 SUBSURFACE EXPLORATION AND LABORATORY ANALYSIS PROCEDURES

As part of the hydrogeologic study at the Menasha Paperboard Plant, a subsurface exploration and laboratory testing program was performed. This program included the sampling and analysis of both soil and water. The objective of this data collection and analysis program was to provide the parameters necessary for the hydrogeologic assessment. The scope of this program included the following:

A. Perform soil borings to assess the subsurface soil stratigraphy and soil types;
B. Estimate the level, flow direction, and velocity of the groundwater;
C. Perform geophysical surveys to estimate the horizontal extent of contamination.
D. Assess groundwater quality;
E. Scan soil samples for the presence of volatile organic vapors.

The following sections provide detailed descriptions of the various subsurface exploration, laboratory analyses, and field tests which were performed.

3.1 Soil Borings and Monitoring Wells

A total of four (4) soil borings were performed by STS Consultants, Ltd. at the Menasha Paperboard Plant. Borings performed by STS at the Menasha Paperboard Plant were performed with a track mounted CME-45 drill rig. Soil samples were collected during drilling, in general accordance with ASTM specification D 1587-67, "Standard Method for Penetration Test and Split Barrel Sampling of Soils". This method is described in the field procedures section of Appendix B. These borings ranged in depth from 34 feet to 41.5 feet, and were performed using hollow stem augers. After drilling and preliminary soil classifications were complete, 2-inch diameter PVC monitoring wells were installed in soil borings B-1, B-2, and B-4. Monitoring well MW-1 was installed with 20 feet of #10 slot PVC screen, and backfilled with pea gravel. Wells MW-2 and MW-4 were installed with 15 feet of #10 slot PVC screen and backfilled with pea gravel.

Drawing #1 shows the location of all soil borings and monitoring wells utilized in this study. Table #1 summarizes pertinent elevation data for each of the wells and soil borings. The tops of all monitoring wells were referenced to a benchmark which is described as the floor slab of the wood chip conveyor building. The exact elevation of this benchmark is not known and was assigned an arbitrary elevation of 100.00. Boring logs and well construction diagrams are provided in Appendix A.

Specific details regarding the soil conditions at the boring locations are indicated on the respective soil boring logs. Stratification lines on these logs show the approximate transition from one soil type to another; they are not intended to indicate an exact geological change. Variations between borings can occur.

TABLE #1

MENASHA CORPORATION - HYDROGEOLOGIC STUDY

SUMMARY OF SOIL BORINGS AND WELL INSTALLATIONS

	Elevation (feet)			
Soil Boring/Well Designation	Top Of PVC Pipe	Ground Surface	Top Of Screen	Bottom Of Screen
B-1/MW-1	92.59	92.80	80.50	60.60
B-2/MW-2	94.52	94.50	75.50	60.50
B-3	N/A	99.00	N/A	N/A
B-4/MW-4	93.03	93.20	68.70	53.70

3.2 Geophysical Explorations

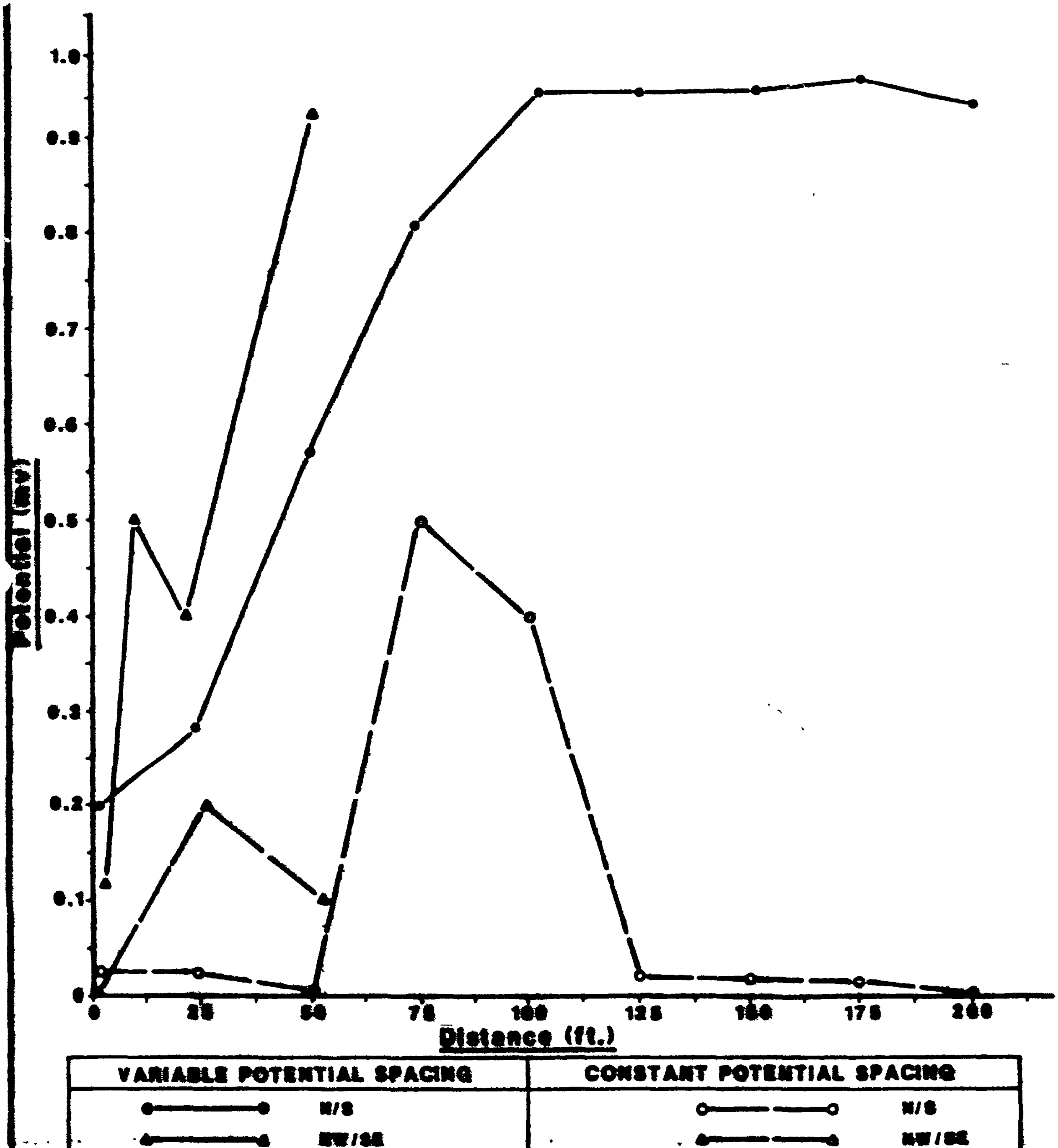
Several geophysical techniques were utilized to estimate the horizontal extent of contamiantion at the Menasha Paperboard Plant. Specifically, the geophysical methods utilized included electrical resistivity, electromagnetics (EM) and photo-ionization detection. Each of these geophysical test methods are described in detail below.

3.2.1 Electrical Resistivity

The electrical resistivity testing was performed by placing a current electrode down the monitoring well with the second current electrode at large distance. Potential readings were then taken in the line of the two current electrodes using various potential electrode spacings. The predominant direction of exploration was south from the monitoring well location as this area was accessible and not obstructed by wood chip piles. The area to the northeast was obstructed while a short line could be done to the northwest. The results of the potential readings are shown in Figure 2. The electrical resistivity test results are discussed in a later section of this report.

3.2.2 Electromagnetics (EM)

Electromagnetic readings were performed with a Geonics EM-31. These readings were performed over a fairly broad area. The reading methodology consisted of a general walk over the site to establish typical background levels, and then grid lines were established so that actual reading could be taken. A contour map of the raw EM readings is shown on Drawing 1. The EM results are discussed in a later section of this report.



STS Consultants Ltd.

PROJECT: MENASHA HYDROGEOLOGIC STUDY	FIGURE NO. 1
TITLE: RESULTS OF RESISTIVITY SURVEY	JOB NO. 1673

3.2.3 Volatile Organic Compound Scans

As each soil sample was removed from the borehole, it was quickly placed in a clean, air-tight soil sample jar. Upon the sample's return to the laboratory, it was analyzed for the presence of volatile organic compounds, using an HNU model 101 photo-ionizer. The HNU meter is a portable trace gas analyzer used to measure relative concentrations of various organic vapors. The sensor consists of an ultra-violet light source, and a 9.8 electron volt lamp, which has the ability to ionize organic species without effecting the major components of the air. Prior to taking HNU meter readings of the soil samples, the background air quality was recorded.

Because the HNU photo-ionizer was calibrated using benzene gas, a compound with ionization characteristics similar to the organic compounds found in petroleum products, meter readings can be interpreted as parts per million (PPM) of volatile organic compounds in the soil gas. It is not possible to conclude that other contaminants, requiring a greater ionization energy did not exist in the samples tested.

Shown on Table #2 are the readings which were obtained when the volatile organic compound scans were performed on the soil samples obtained at the Menasha Paperboard Plant.

TABLE 2

MENASHA CORPORATION

INVESTIGATION OF HYDRAULIC OIL SPILL

VOLATILE ORGANIC COMPOUND SCAN - VOC'S (PPM)

Depth	MW-1 EL = 92.7 ft.
Ø - 1.5	N/R
2.5 - 4	N/R
5 - 6.5	N/R
7.5 - 9	N/R
1Ø - 11.5	N/R
12.5 - 14	N/R
15 - 16.5	N/R
17.5 - 19	> 1
2Ø - 21.5	N/R
22.5 - 24	N/R
25 - 26.5	N/R
3Ø - 31.5	N/R
32.5 - 34	N/R

Background ≅ 1 ppm.

N/R = No Reading Above Background.

3.2 Analytical Testing Laboratory Results

Burmah Labs of Pontiac, Michigan, an analytical testing laboratory, performed water quality analyses for water samples which were retrieved from the three STS monitoring wells, at the site. Analyses were also performed on selected soil samples gathered during the subsurface exploration. Finally, a product sample of the suspected contaminant was analyzed.

3.2.1 Water Quality Analysis

The water samples collected from wells MW-1, 2, and 4 were analyzed for volatile organic compounds (VOH), chlorides, sodium, and calcium. The water samples were retrieved from the monitoring wells using a clear lucite well bailer. In order to collect the water samples and correctly assess and gather any free product which might be present, the following sampling protocol (modified from Reference 5) was used:

1. The well bailer was cleaned and a new sampling rope was attached.
2. The bailer was lowered to the water surface and slowly put into the water column approximately 1.5 feet. The bailer is fitted as a bottom seated check valve to allow water samples to enter the bailer from the bottom.
3. The bailer was extracted slowly, and once at the surface, the free product thickness (if any) was assessed.
4. If no free product, cloudy, or oily appearance is noted on the bailer or its contents, the sample is discarded and the well is purged of 3 water volumes and all samples are collected. If

the initial bailer shows free product or evidence of dissolved product, the VOC sample is collected from the top water and the well is then purged 3 volumes before collecting any other samples which might be required.

5. The bailer is cleaned with soap and water, and the sample line is replaced before the next well is sampled.

Once the samples were recovered from the wells, they were refrigerated and transported to the testing laboratory. Analyses were then performed only on the supernatant liquid. No analyses were performed on any filtered or precipitated sediments which might have been present.

Table #3 presents a water quality analysis summary for the monitoring wells and the product sample.

The results of the volatile organic scans are presented as a range for each chemical species. The water samples were analyzed for volatile organic compounds by gas chromatography methods, EPA No. 601 and 602. The purpose of these analyses was to scan for gross contamination and provide a method for matching contamination in wells with possible sources. No attempt was made to further define the amounts of each parameter which were in each sample.

TABLE 3
MENASHA CORPORATION
INVESTIGATION OF HYDRAULIC OIL SPILL
WATER QUALITY ANALYSIS

Water Quality Parameter	MW-1	MW-2	MW-4
*p.p.m.			
**Volatile Organic Compounds	N/D	N/D	N/D
Chloride	85	70	310
Calcium	360	690	940
Sodium	50	15	180

*Milligram/liter unless noted.
**Detection limits microgram/liter.
N/D = no response over detection limits of 1 microgram/liter.

3.2.2 Soil Sample Analysis

During the subsurface exploration, discrete soil samples were collected in sterile sample jars. These jars were sealed and returned to the STS Soils Laboratory. Except for classifying, the soil samples were not opened until they were received at the analytical laboratory in Brighton, Michigan.

To minimize the possibility that cross contamination between soil samples did not occur, specific field protocol was used, which involved washing of soil samplers with trisodium phosphate between each sampling.

Once at the test laboratory, oil and grease fractions in the soil samples were stripped using Freon Gas. The results of the oil and grease analyses are shown in Table 4.

A VOC scan was performed on one sample, B1-S8 (17.5 to 19.5 feet), of the oil and grease collected in the Freon. The same methods of analysis as described in Section 3.2.1 were used. The purpose of this VOC scan was to determine the type of oil and grease which might be present. The results of this scan showed the oil and grease in the soil was entirely pertroleum distillates (approximately 22,000 mg/kg.) with the lightest fraction (a distillate of approximately 20 carbons).

TABLE 4
MENASHA CORPORATION
INVESTIGATION OF HYDRAULIC OIL SPILL
OIL AND GREASE ANALYSIS OF SOIL SAMPLES (Mg/Kg)

	Surface Elevation	
Depth	MW-1	MW-2
	92.7	94.5
0 - 1.5	58	1800
2.5 - 4	13	210
5 - 6.5	8700	71
7.5 - 9	8200	170
10 - 11.5	26	19
12.5 - 14	31	-
15 - 16.5	350	< 5
17.5 - 19	22000	-
20 - 21.5	11000	19
22.5 - 24	-	-
25 - 26.5	- *	11*
30 - 31.5	68	5
32.5 - 34	9	-

- Denotes no sample
* Approximate water depth on 4-10-86
** Detection limits 5 mg/kg.

3.2.3 Product Analysis

One sample of the mobil hydraulic oil, the suspected contaminant, was analyzed by the gas chromatography method, EPA No. SW810 & 820. The results of this scan showed that the oil was entirely petroleum distillate, both heavy and light fraction. The purpose of this analysis is to develop a "finger print" of the suspected contaminant so that GC analyses of the contaminated soils could be compared. The results of the "finger printing" method of contamination by GC will be discussed in the analysis section, to follow.

4.0 HYDROGEOLOGIC ANALYSIS OF SITE

4.1 Site Geology

The geologic setting of the Menasha site is the result of glacial deposition and the later reworking of these glacial deposits. The bedrock of this area consists of a lower Mississippian Age coldwater shale. The top elevation of this bedrock unit varies between 500 and 550 feet above sea level. The bedrock is overlain by 200 to 250 feet of glacial material.

Soil borings performed at the site indicate that the overburden of the site consists primarily of sands and outwash covering glacial till. Granular soils encountered consisted primarily of light brown, fine to medium sand with traces of gravel. Several soil samples taken indicate that the sand is representative of what could be termed a beach sand. The beach would be oriented just north of a glacial lake which once existed. Located approximately 35 feet below the surface and under the sand lies a cohesive sandy clay layer.

A geologic cross section of the site is shown on Drawing 2. Of specific interest to this study is the sandy clay strata encountered in Boring #3. The continuity of this clay layer is unknown at this time. However, based on other borings reviewed in this area, it is likely that strata is discontinuous.

4.2 Groundwater Conditions

The groundwater monitoring wells installed at the site were constructed with well screen intersecting the water table. On one occasion, the water levels in these three wells were measured. The results of the survey is shown below:

	WATER SURFACE ELEVATION	
	Ground Surface	Date
Well No.	Elevation	4-10-86
1	92.80	65.82
2	94.5	66.31
3	93.2	59.57

The general direction of groundwater flow at the site appears to be from northeast to southwest, directly towards water supply well #5. However, the silty clay layers encountered in Boring #3 probably affects the local flow patterns. Furthermore, the groundwater flow directions at this site are probably also affected by the water fluctuations in the Kalamazoo River and the pumping schedules of wells #4, #5, and possibly #8.

The vertical component of groundwater flow was not measured at this site. All STS monitoring wells showed good recharge during development.

4.3 Geophysical Analysis

As discussed in Section 3.3, three geophysical methods were used at the project site. There were electrical resistivity, electromagnetics, and soil gas analysis. These results will be discussed below.

The electrical resistivity testing results suggested an anomaly approximately 75 feet south of MW-1, as evidenced by a sharp rise in electric potentials (see Figure 2). Boring #3, located at this anomaly, identified the sandy clay strata shown on Drawing 2 and discussed in Section 4.1.

The electromagnetic work which was done at the site resulted in the contour map presented on Drawing 1. This survey identified a major conductive anomaly, located approximately 250 feet south of MW-1. To explore this feature, MW-4 was located in the center of this anomaly. Analysis of water samples form this well showed elevated levels of calcium, sodium, and chlorides (Table 3). It is believed that this contamiantion originated from the chip conveyor where large quantities of calcium chloride and sodium chloride are used to de-ice the chipper approach during the winter. The implications of these elevated salt levels will be discussed in Section 4.6.

Photo-ionization scans were performed on soil samples and the borehole during the drilling of MW-1. Furthermore, soil samples collected from MW-1 were scanned in the laboratory. All scans showed no indication of organic hydrocarbons, except sample 8, where a reading only slightly above background was noted. Sample 8 also was discolored from the natural brown sand, to gray. It is believed that due to the relatively non-volatile nature of the hydraulic oil, that only high concentrations of oil would register a significant reading.

4.4 Analysis of Soil and Product Sample

As presented earlier, soil samples were collected and analyzed for oil and grease content. Furthermore, one of the samples, S-8 of Boring 1, was analyzed using gas chromatography methods. Finally, a sample of hydraulic oil collected in the chip conveyor bailing was analyzed using G.C. methods.

The results of the oil and grease analysis, those shown on Table 4 are superimposed on Drawing #2 the geologic cross-section. Upon inspection of this drawing, several features are apparent. First, several slugs or wetted plumes of oil and grease appear to be suspended in the soil strata. This is apparent by the areas of high concentration bordered by areas of very low concentration. Furthermore, it appears that the geology has favored movement towards well MW-1, as evident by the higher levels of contamination in ths well, caused by the coarser sand and gravel in the first 9.5 feet of this well. Finally, relatively low levels of oil and grease were evident below the measured water table.

The product which is evident below the water table could have migrated there during time when the water table was temporarily depressed by seasonal variation or pumping.

The results of the G.C. analysis on the soil sample were compared with the results from the products analysis. Based on the chromatograph of the product and extract from sample B1-S8, the contaminate in the soil is hydraulic oil of the type collected from the chip conveyor building.

4.5 Water Quality Analysis

The results of the water quality analysis are shown on Table 3. Prominant on this table are the relatively high levels of chloride, calcium and sodium in well MW-4, and the overall high levels of calcium in all wells. Furthermore, no responses of volatile organic compounds above 1 p.p.b. (microgram/liter) was observed in any of the samples from the wells.

The purpose of installing well MW-4 was to investigate the soil conductivity anomally observed during the electromagnetic survey. It is believed that this anomaly was possibly caused by salt, used to reduce ice build-up on the approach of the chip conveyor. The relatively elevated levels of chloride, calcium and sodium in well MW-4 account for the EM anomaly.

TABLE 5

MENASHA CORPORATION - HYDROGEOLOGIC STUDY

MONITORING WELL WATER QUALITY

VS.

NATIONAL DRINKING WATER STANDARDS

Water Quality Parameter (mg/l)	National & Secondary Drinking Water Standards mg/l	Normal** Constituents in Groundwater	Well #1	Well #2	Well #4
Chloride	250	10-1000	85	70	310
Calcium	250*	<100	360	690	940
Sodium	-	<200	50	15	180

*Recommended Limit - not enforceable.

**Reference 6

***Reference 7

The levels of chloride in well MW-4 exceed the National Secondary Maximum Contaminant levels. However, these levels are only recommended and are not enforceable.

The high chloride level could impart a salty taste to the water from production well #5, since groundwater from MW-4 probably enters well #5. The levels of calcium in all wells are elevated but should not be objectionable for human consumption.

STS recommends that Menasha evaluate the results of the water quality analysis, as reported. Specifically. the high levels of calcium will cause detrimental effects on the plant's piping. Furthermore, the methods of de-icing on the conveyor should be reviewed.

5.Ø CONCEPTUAL REMEDIAL ALTERNATIVES

As part of this study, several remedial alternatives are based on existing information and are developed to best fit the site constraints as they are recognized at this time.

Currently, four methods of remedial action are apparent. First would be the "no action" alternative. Secondly there is the installation of spill contaminant and an impermeable layer over the spill layer. Thirdly, would be the complete removal of contaminated soils to background levels, and finally, biological degradation of contamination.

5.1 No Action

Soil sample analysis for oil and grease have shown soil contamination extending from the ground surface to and into the groundwater table. However, groundwater analysis has shown no contamination above 1 ppb. A no action alternative in this case would include a groundwater monitoring program. The groundwater from wells MW-1, 2, and 3, should be analyzed for volatile organic hydrocarbon and petroleum distillates on a six month basis.

It is conceivable that the no-action alternative is only a stop-gap response, since hydraulic oil in significant concentrations in the soil column is expected to eventually reach the water table, causing significant contamination.

In addition, with this alternative, the soil surface would still be open to additional leaks of hydraulic oil. The probability of organic soil and groundwater contamination opens Menasha Corporation to possible pollution liabilities.

5.2 Spill Containment

Specifically, spill containment is a three phase alternative which would include:

- o Building spill containment;
- o Placement of an exterior asphalt spill containment;
- o Monitoring program.

Building spill containment would basically consist of curbs about the interior of the oil storage building. These curbs would contain all oil leaks to the building interior and leakage from the doorway.

The exterior containment system would consist of an impermeable concrete liner under the entire area where hydraulic oil could leak if a hydraulic line break occurs. The system would be designed such that differentiation between stormwater runoff and hydraulic oil could be accomplished so that stormwater inflow is minimized. Most likely, the containment area would be fitted with stoplogs so that all liquids would be held in an open ponded area. If the liquid in containment is only stormwater, it could be diverted to a separate storm drain system. If the containment is holding hydraulic oil, the stoplogs could be opened and the oil will flow down a flume to the waste oil sump.

An alernative to diversion of oil wastes and stormwater would be the containment of all spills and stormwater in one area. An oil skimmer pump could remove the surface oil from this containment and the skimmed effluent could be sent to the incinerator. The contaminated stormwater would be treated by the white water system of the plant.

The cost of the containment slab would be on the order of \$35,000 to \$40,000 for a 5" thick industrial reinforced slab with water stops. Including site preparation and piping for stormwater diversion, this alternative could cost approximately \$50,000 or more.

5.3 Total Excavation of Contaminant

An anonymous contact was made to the Michigan Department of Natural Resources (MDNR) regarding the contamination which was discovered at the chip conveyor. The contact person was Mr. Galen Kilmer of the Plainwell District office. Mr. Kilmer outlined a two phase project:

- o Remove contaminated soil to detection limits (rather than background reading);
- o Develop a spill prevention plan which incorporates procedures for subsequent clean-up of spills.

The cost for complete excavation of the contaminated soil alone would be approximately \$62,000 for 28,000 C.Y. This does not include disposal of the soil or trucking. Furthermore, this cost does not include reconstruction of the chip conveyor system or backfilling. Total costs are expected to exceed \$130,000.00.

5.4 Biodegradation

Biodegradation by micro-organisms could be used to consume the oil wastes in the soil. This method includes the installation of an irrigation system or pump system to artificially raise the water table under the chipper to completely saturate all contaminated soil. Then, micro-organisms present in the soil are nourished with nutrients injected through the irrigation system. This method would eventually consume the oil contamination, although it would be the most costly solution.

Bench scale tests would have to be run on both the contaminate and site groundwater to determine applicable flow rates of nutrients.

5.5 Summary

Four possibly remedial alternatives have been presented. The table below summarizes the advantages and disadvantages of each alternative:

Remedial Alternative	Advantage	Disadvantage
No-Action	Low initial cost; <$500.00/year	Surface is left open to increased contamination movement. Menasha is left completely unprotected from liability.
Spill Containment	Closes surface to more spills of hydraulic oil. Infiltration to surface is halted, thereby slowing the vertical movement of the oil currently suspended in the sand.	Menasha is still held open to liability if large amounts of oil ever reach the groundwater.

	Initial cost of installation is low compared to complete site clean-up; approximately $50,000.00.	
Soil Excavation	Complete removal of all contaminated soil.	Cost for excavation alone is greater than $62,000. Removal and reconstruction of chip conveyor required. Purchase new backfill. Soil must be disposed of as a hazardous material.
Biodegradation	Not disruptive to chip conveyor operations. Consumption of all contamination in the soil. Costs are generally less than excavation & disposal.	Approximately 2 years for complete clean-up. Bench tests must be run to evaluate feasibility, timing, and final costs.

Based on the table above, the alternative of spill containment appears to be the most viable alternative.

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 Summary

Menasha Corporation owns and operates the Otsego Paperboard Plant in Otsego, Michigan. The plant is located on the east side of Farmer Street, on the north side of the Kalamazoo River. Leaks of hydraulic oil from the chip conveyor have caused soil contamination. In order to estimate the extent of contamination, this hydrogeologic study was performed.

This report provides an assessment of the existing hydrogeologic condition in the vicinity of the chip conveyor. Furthermore, this study estimates the vertical extent of soil contamination which has been found. Specific items which have been addressed include; groundwater elevations, groundwater flow directions, types of contamination, and several alternatives to remediation of the site.

The following section summarizes conclusions and recommendations which have been developed as a result of this hydrogeologic investigation.

6.2 Conclusions & Recommendations

Following is a list of conclusions and recommendations which have resulted from this hydrogeologic study:

A. Contamination from hydraulic soil in concentrations up to 22,000 mg/kg have been identified at the project site. The contamination concentrations vary with depth, with relatively high concentrations enclosed by areas of relatively low concentrations.

B. Soil contamination has been identified below the water table although no groundwater contamination from organic compounds above detection limits has been identified. The oil contamination below the water table was probably caused by fluctuations in the water table caused by pumping.

C. Groundwater contamination from calcium and chlorides has been identified with electromagnetic methods. This contamination has most likely originated from applications of salt on the chipper approach.

D. General groundwater flow appears to be from the NE to the SW. Local geologic anomalies will alter the flow patterns. Pumping from the plants supply wells will also alter this pattern.

E. The geology of the site consists of sand and gravels interbedded with lenses of silty clay.

F. The no-action alternative is probably not acceptable since continuing hydraulic oil contamination would probably occur. Also, the flushing action of infiltration water could contribute to more rapid hydraulic oil movement through the soil.

G. Total soil removal is not feasible, since it would disrupt operations of the chip conveyor system.

H. Installation of a biodegradation system, which would consume the oil contamination in the soil, would require additional analysis to determine feasibility.

I. The most viable remedial alternative is a spill containment and disposal system in conjunction with a monitoring program. The specifics of this sytem would need to be developed and reviewed by Menasha Corporation.

REFERENCES

1. STS Consultants, Ltd., "Spend Liquor/Sludge Storage Facility", Lansing, Michigan, STS Project No. 70672, August, 1981.

2. STS Consultants, Ltd., "Menasha Corporation - Civil Engineering Services for New Tank and Pond Construction", Lansing, Michigan, STS Project No. 70810, April, 1982.

3. STS Consultants, Ltd., "Hydrogeologic Report - New Tanks and Ponds", Lansing, Michigan, STS Project No. 70875, August, 1982.

4. STS Consultants, Ltd., "Closure of Type III Landfill", Lansing, Michigan, STS Project No. 70901, October, 1982.

5. U.S. Environmental Protection Agency, "Manual of Ground-water Quality Sampling Procedures", National Water & Well Association, Worthington, Ohio, 1981.

6. Michigan Environmental Health Association, "Environmental Health Ready Reference", Second Edition, pp 59-60, November, 1983.

7. Todd, David Keith, Groundwater Hydrology, John Widey & Sons, New York, 1980.

MEN01718

STS Consultants Ltd.

OWNER	LOG OF BORING NUMBER
MENASHA PAPER CORP.	B-1
PROJECT NAME INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER

SITE LOCATION: OTSEGO, MICHIGAN

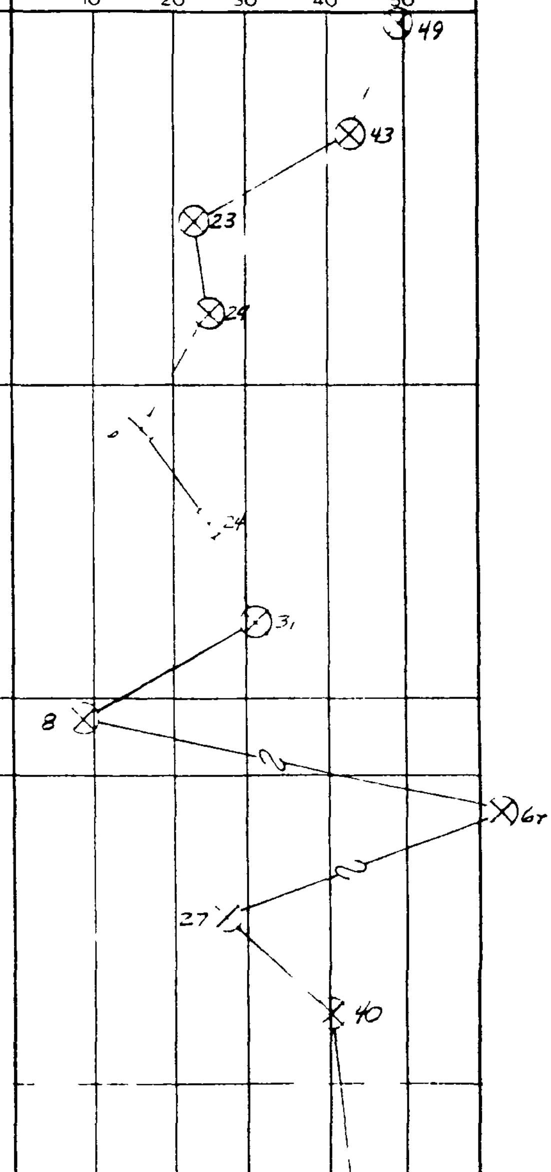
SURFACE ELEVATION 92.7 FT.

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² : 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % : 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT : 10 20 30 40 50

DEPTH	SAMPLE NO	SAMPLE TYPE	DESCRIPTION OF MATERIAL
0	1	SS	BROWN COARSE SAND AND GRAVEL - OCCASSIONAL SMALL COBBLES - MOIST - DENSE TO MEDIUM DENSE. (GP-SP)
	2	SS	
5	3	SS	
	4	SS	
10	5	SS	BROWN FINE TO MEDIUM SAND - TRACE SILT AND GRAVEL - MOIST MEDIUM DENSE. (SP)
	6	SS	
15	7	SS	
	8	SS	GRAY FINE TO MEDIUM SAND - TRACE GRAVEL - WET - LOOSE. (SP)
20	9	SS	BROWN FINE TO MEDIUM SAND - TRACE GRAVEL - MOIST TO WET - MEDIUM DENSE TO DENSE. (SP)
	10	SS	
25	11	SS	
			BROWN FINE SAND - SOME SILT - SATURATED - MEDIUM DENSE. (SP-SM)
30			CONTINUED



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU. THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO 1073

BL 2 983

MEN01719

STS Consultants Ltd.	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-1
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER

SITE LOCATION: OTSEGO, MICHIGAN

SURFACE ELEVATION 92.7 FT.

DEPTH	SAMPLE NO	SAMPLE TYPE	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT
30	12	SS	BROWN FINE SAND - SOME SILT - SATURATED - DENSE. (SP-SM)	43
	13	SS	BROWN CLAYEY FINE SAND - SOME SILT - SATURATED - MEDIUM DENSE. (SC-SM)	11
35				

END OF BORING

NOTES 1. SAMPLE S-8 HAD PETROLUEM ODOR. OBTAINED FLICKER OF NEEDLE ON H'NU METER. 2. SAMPLES S-12 AND S-13 HAD LIGHT FILM OF OIL ON OUTSIDE OF SPLIT SPOON WHEN EXTRACTED FROM BOREHOLE.

BORING ADVANCED TO 32.5 FT. USING HOLLOW STEM AUGER. INSTALLED MONITORING WELL. SEE WELL INSTALLATION DIAGRAM.

TOP OF PVC ELEVATION 92.58 FT.

40

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL 29.0 FT. WD (WS OR WD)	BORING STARTED 02-07-86	STS OFFICE LANSING	
WL 30.0' BCR / ACR	BORING COMPLETED 02-07-86	DRAWN BY CJD	SHEET NO. 2 OF 2
WL 28.0 AB	RIG BOMB FOREMAN DC	APP'D BY TDG	STS JOB NO. 1073

BL: 1-083

MEN01720

STS Consultants Ltd.	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-4
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER
SITE LOCATION: OTSEGO, MICHIGAN		

SURFACE ELEVATION 93.2 FT.

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.²: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT.³	STANDARD PENETRATION BLOWS/FT
0		1A	SS			WOOD CHIPS		
		1B	SS			TOPSOIL		
		1C	SS			BROWN FINE TO MEDIUM SAND - LITTLE GRAVEL - TRACE SILT - MOIST - MEDIUM DENSE. (SP)		
		2	SS					10
5		3	SS			YELLOW MEDIUM SAND - TRACE GRAVEL - TRACE SILT - MEDIUM DENSE. (SP)		
		4	SS			BROWN FINE TO MEDIUM SAND - LITTLE GRAVEL - TRACE SILT - MOIST - DENSE. (SP) (ENCOUNTERED COBBLE AT 12 FEET)		32
10		5	SS					
15		6	SS					
20		7	SS			BROWN FINE SAND - TRACE SILT - MOIST TO SATURATED - DENSE TO EXTREMELY STIFF. (SP)		
25		8	SS					
30						CONTINUED		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU, THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO 1073

BL 2-983

MEN01721

STS Consultants Ltd	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-4
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER

SITE LOCATION: OTSEGO, MICHIGAN

SURFACE ELEVATION: 93.2 FT.

DEPTH	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST BLOWS/FT
30	9	SS	BROWN FINE SAND - TRACE SILT - MOIST TO SATURATED - DENSE TO EXTREMELY DENSE. (SP)	5
35	10	SS		37
40	11	SS		88
			END OF BORING	
			BORING ADVANCED TO 40.0 FT. USING HOLLOW STEM AUGER. INSTALLED MONITORING WELL. SEE ENCLOSED WELL INSTALLATION DIAGRAM.	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU THE TRANSITION MAY BE GRADUAL

WL 35.0 FT. WS WS OR WD	BORING STARTED 03-13-86	STS OFFICE LANSING	
WL BCR ACR	BORING COMPLETED 03-13-86	DRAWN BY DDL	SHEET NO 2 OF 2
WL	RIG FOREMAN JW	APP'D BY TDG	STS JOB NO 1073

BL 1 983

MEN01722

STS Consultants Ltd.	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-3
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL.	ARCHITECT ENGINEER

SITE LOCATION: OTSEGO, MICHIGAN

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² — 1, 2, 3, 4, 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % — 10, 20, 30, 40, 50

STANDARD PENETRATION BLOWS/FT — 10, 20, 30, 40, 50

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	UNIT DRY WT LBS/FT³	STANDARD PENETRATION BLOWS/FT
0						ASPHALT		
		1	SS					30
		2	SS					3
5		3	SS					33
		4	SS					18
10		5	SS			BROWN FINE TO MEDIUM SAND - LITTLE GRAVEL - TRACE SILT - MOIST TO WET - DENSE TO VERY LOOSE. (SP)		12
15		6	SS					11
20		7	SS					4
25		8	SS					3
						BROWN FINE SAND - TRACE SILT - WET - DENSE. (SP)		
30						CONTINUED		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO. 1073

BL 2-083

MEN01723

STS Consultants Ltd.

OWNER	LOG OF BORING NUMBER
MENASHA PAPER CORP.	B-3
PROJECT NAME INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER

SITE LOCATION

OTSEGO, MICHIGAN

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS FT³	STANDARD PENETRATION BLOWS/FT
						SURFACE ELEVATION		
30		9	SS			BROWN FINE SAND - TRACE SILT - WET - DENSE. (SP)		43
35		10	SS			GRAY SANDY CLAY - TRACE GRAVEL - WET - FIRM. (CL)		5
		11	SS					5
40						END OF BORING		
						BORING ADVANCED TO 37.5 FT. USING HOLLOW STEM AUGER. BOREHOLE BACKFILLED WITH 3 FEET OF BENTONITE PELLETS AND SOIL CUTTINGS.		

Chart scales: UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5; PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50; STANDARD PENETRATION BLOWS/FT 10 20 30 40 50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 03-14-86	STS OFFICE LANSING		
WL BCR ACR	BORING COMPLETED 03-14-86	DRAWN BY DDL	SHEET NO. 2 OF 2	
WL	RIG FOREMAN JW	APP'D BY TDG	STS JOB NO 1073	

BL 1-083

MEN01724

STS Consultants Ltd.	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-2
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER

SITE LOCATION: OTSEGO, MICHIGAN

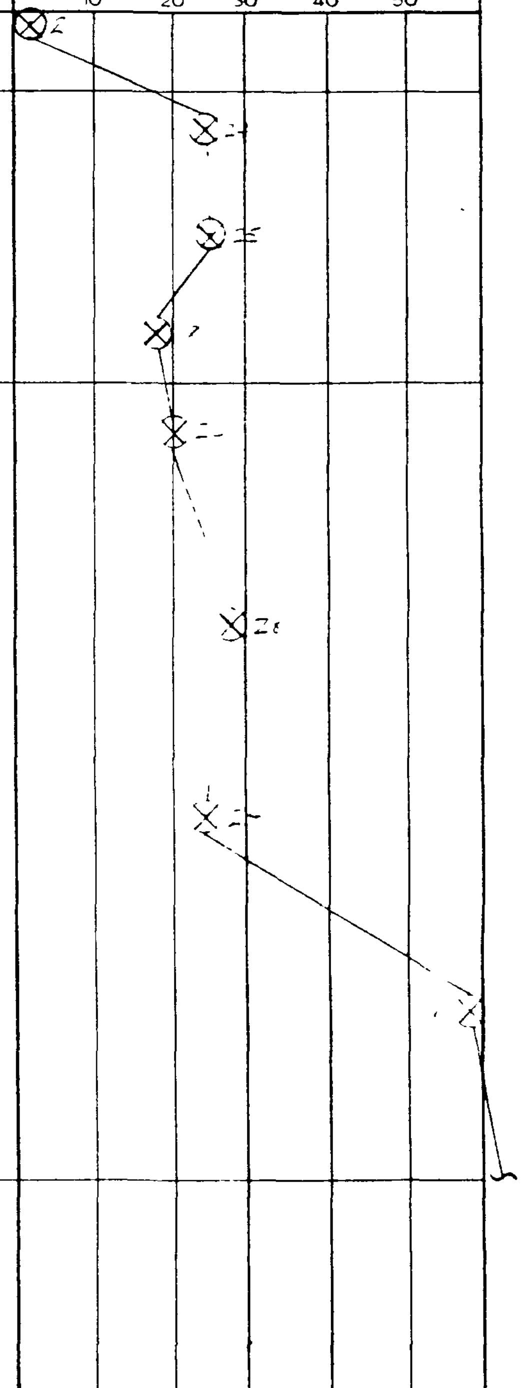
SURFACE ELEVATION 94.5 FT.

UNCONFINED COMPRESSIVE STRENGTH TONS/FT²: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT³
0		1	SS			WOOD CHIPS	
		2	SS			BROWN FINE TO MEDIUM SAND - TRACE GRAVEL - TRACE SILT - WET - MEDIUM DENSE. (SP)	
5		3	SS				
		4	SS				
10		5	SS				
15		6	SS			BROWN FINE SAND - TRACE GRAVEL - TRACE SILT - MOIST TO SATURATED - MEDIUM DENSE TO VERY DENSE. (SP)	
20		7	SS				
25		8	SS				
30						CONTINUED	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU. THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO 1073

BL 2-083

MEN01725

STS Consultants Ltd.	OWNER: MENASHA PAPER CORP.	LOG OF BORING NUMBER: B-2
	PROJECT NAME: INVESTIGATION OF HYDRAULIC OIL SPILL	ARCHITECT ENGINEER
SITE LOCATION: OTSEGO, MICHIGAN		

SURFACE ELEVATION 94.5 FT.

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² — 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % — 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT — 10 20 30 40 50

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS FT³	Standard Penetration
30		9	SS			BROWN FINE SAND - TRACE GRAVEL - TRACE SILT - MOIST TO SATURATED - MEDIUM DENSE TO VERY DENSE. (SP)		63
35		10	SS			BROWN SANDY CLAY - TRACE GRAVEL - WET - STIFF. (CL)		19 *
						END OF BORING		
40								

○* CALIBRATED PENETROMETER

BORING ADVANCED TO 35.0 FT. USING HOLLOW STEM AUGER. INSTALLED MONITORING WELL. SEE ENCLOSED WELL INSTALLATION DIAGRAM.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

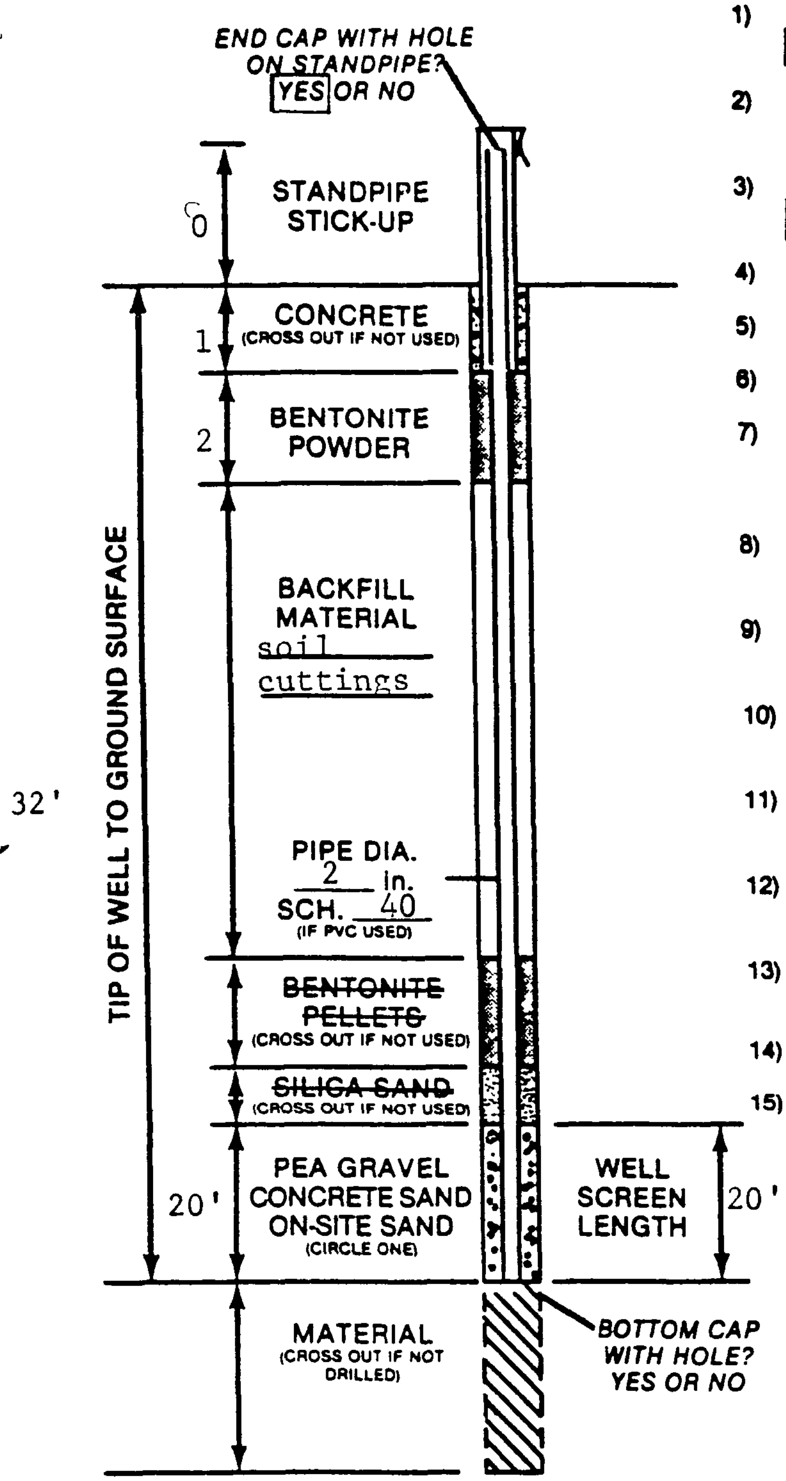
WL 23.0 FT. WDWS OR WD	BORING STARTED 03-17-86	STS OFFICE LANSING	
WL BCR ACR	BORING COMPLETED 03-17-86	DRAWN BY DDL	SHEET NO. 2 OF 2
WL	RIG FOREMAN JW	APP'D BY TDG	STS JOB NO 1073

BL 1-983

STS Consultants Ltd.

MEN01726

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
$\boxed{\text{PVC}}$ GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, $\boxed{\text{THREADED,}}$ OTHER ______

3) TYPE OF WELL SCREEN
$\boxed{\text{PVC}}$ GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE #10 slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR $\boxed{\text{NO}}$

6) WAS SOLVENT USED? YES OR $\boxed{\text{NO}}$

7) ~~WAS DRILLING MUD USED?~~
SOLID AUGER, $\boxed{\text{HOLLOW STEM AUGER,}}$
~~WATER, REVERT, BENTONITE~~

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR $\boxed{\text{NO}}$

9) HOW WAS WELL DEVELOPED?
$\boxed{\text{BAILING,}}$ PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER ______

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER ______

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER INSTALLATION
28 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

Well No. MW - 1 DATE INSTALLED 02-07-86 DRILL RIG Bombadier

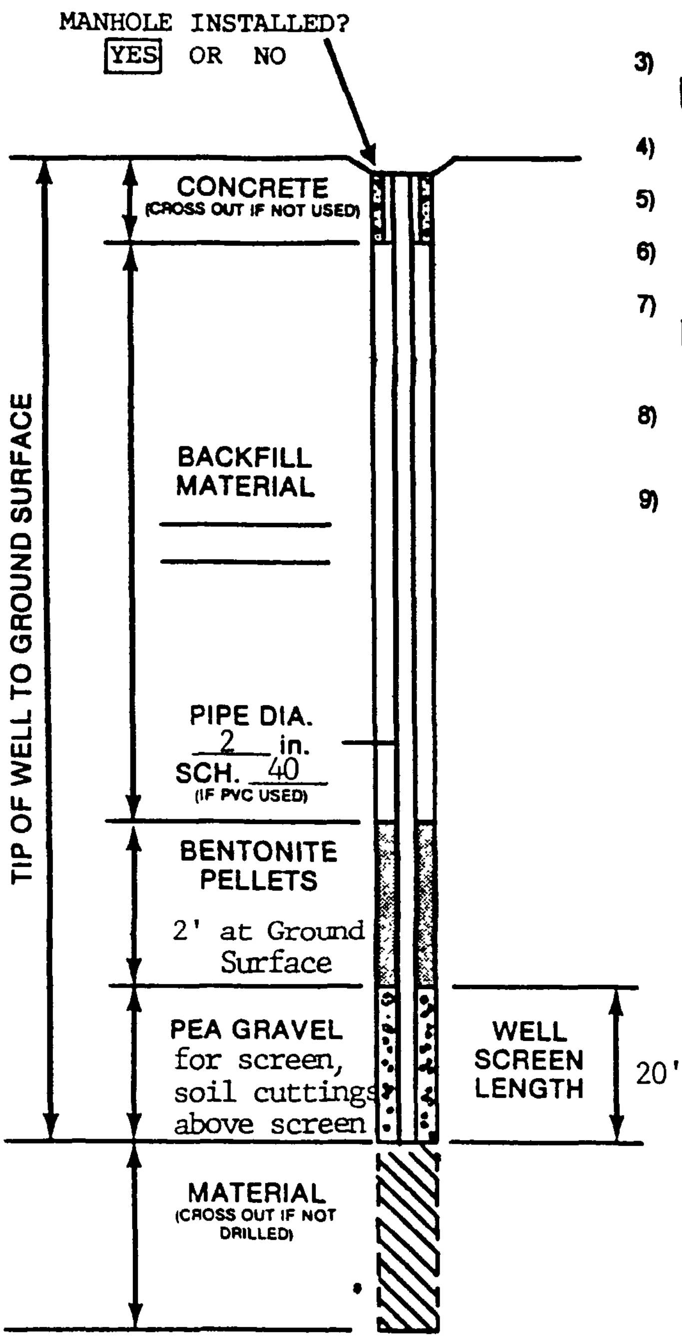
DRILLER Dick Carlson DRILL CREW Alan Branstrom/Tom Gentner

JOB/CLIENT Menasha Paper Corp. STS JOB No. 1073

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
 $\boxed{\text{PVC,}}$ GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS?
 BELLED, COUPLINGS, $\boxed{\text{THREADED,}}$ OTHER ______

3) TYPE OF WELL SCREEN
 $\boxed{\text{PVC,}}$ GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR $\boxed{\text{NO}}$

6) WAS SOLVENT USED? YES OR $\boxed{\text{NO}}$

7) WAS DRILLING MUD USED?
 $\boxed{\text{~~SOLID AUGER,~~}}$ $\boxed{\text{HOLLOW STEM AUGER,}}$
 WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
 YES OR $\boxed{\text{NO}}$

9) WATER LEVEL SUMMARY

 1) DEPTH FROM T. STANDPIPE AFTER INSTALLATION?
  28 Ft. or DRY

 2) OTHER MEASUREMENTS:

  DATE ________, ________ Ft. FROM T, ST. PIPE
  DATE ________, ________ Ft. FROM T, ST. PIPE
  DATE ________, ________ Ft. FROM T, ST. PIPE
  DATE ________, ________ Ft. FROM T, ST. PIPE

Well No. MW - 1 DATE INSTALLED 02-07-86 DRILL RIG Bombadier

DRILLER Dick Carlson DRILL CREW Alan Branstrom/Tom Gentner

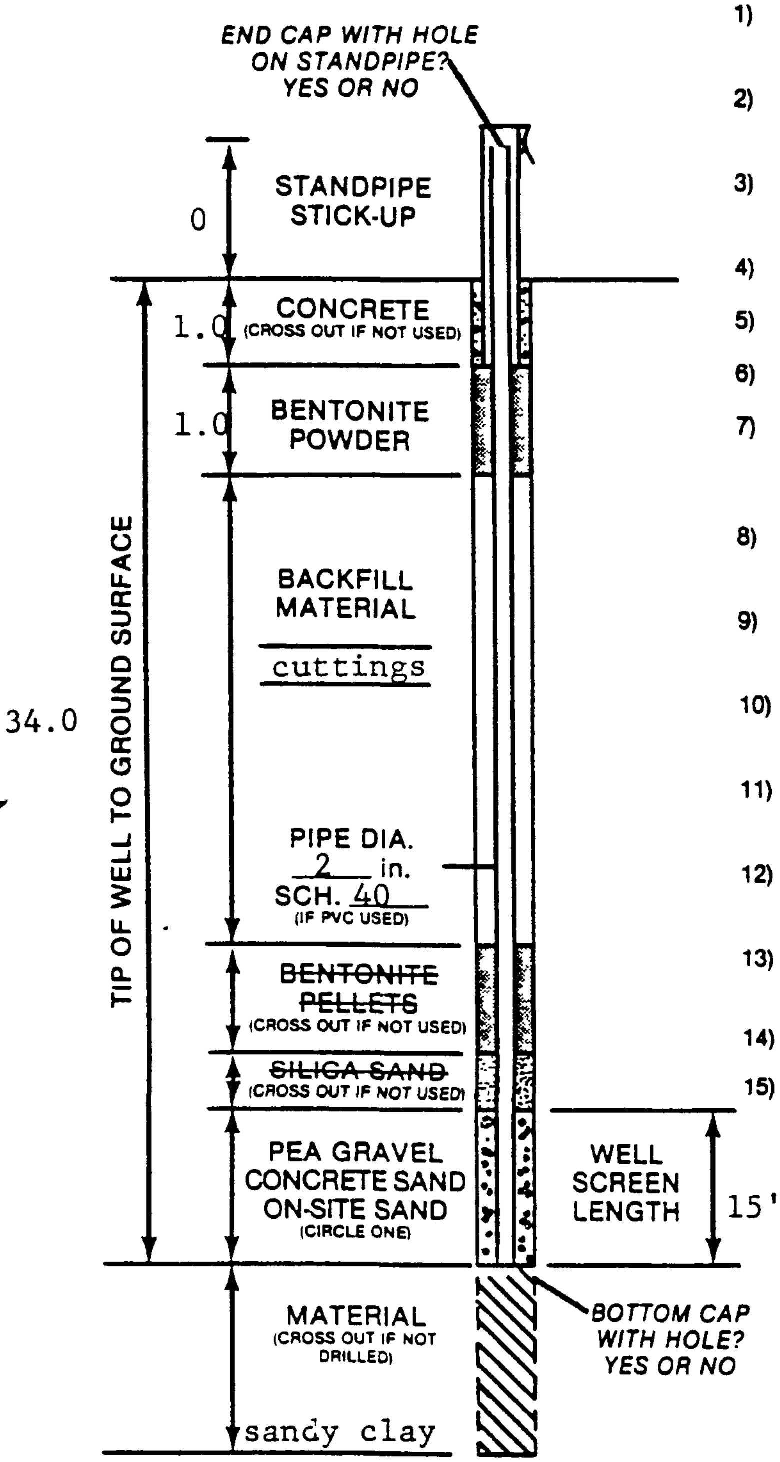
JOB/CLIENT Menasha Paper Corp. STS JOB No. 1073

FW: 1-983

MEN01728

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
$\boxed{\text{PVC,}}$ GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, $\boxed{\text{THREADED,}}$ OTHER ______

3) TYPE OF WELL SCREEN
$\boxed{\text{PVC,}}$ GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE .010

5) INSTALLED PROTECTOR PIPE W/LOCK? manhole

6) WAS SOLVENT USED? YES OR $\boxed{\text{NO}}$

7) WAS DRILLING MUD USED?
SOLID AUGER, $\boxed{\text{HOLLOW STEM AUGER}}$
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR $\boxed{\text{NO}}$

9) HOW WAS WELL DEVELOPED?
$\boxed{\text{BAILING,}}$ PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., $\boxed{\text{30 min.,}}$ OTHER ______

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
$\boxed{\text{5 gal.}}$ 10 gal., 15 gal., OTHER ______

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, $\boxed{\text{OPAQUE}}$

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, $\boxed{\text{TURBID,}}$ OPAQUE

14) DID THE WATER SMELL? YES OR $\boxed{\text{NO}}$

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
29.0 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

Well No. 2 DATE INSTALLED 03-17-86 DRILL RIG CME 45

DRILLER John Wright DRILL CREW Bruce Penfield

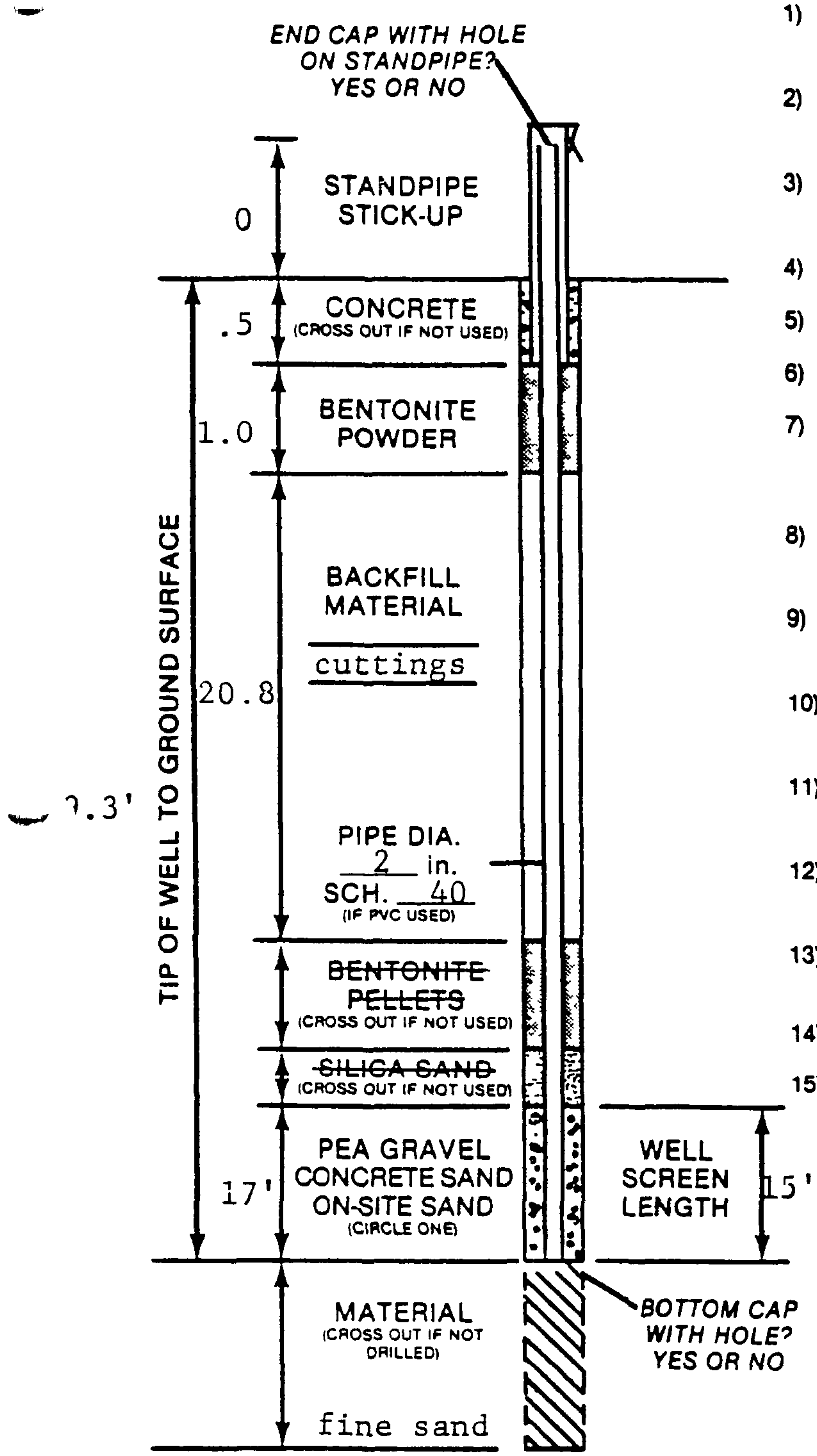
JOB/CLIENT Menasha Paper STS JOB No. 1073

FW. 1-983

STS Consultants Ltd.

MEN01729

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
$\boxed{\text{PVC}}$ GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, $\boxed{\text{THREADED}}$ OTHER ______

3) TYPE OF WELL SCREEN
$\boxed{\text{PVC,}}$ GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SIZE .010

5) INSTALLED PROTECTOR PIPE W/LOCK? manhole

6) WAS SOLVENT USED? YES OR $\boxed{\text{NO}}$

7) WAS DRILLING MUD USED?
SOLID AUGER, $\boxed{\text{HOLLOW STEM AUGER,}}$
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR $\boxed{\text{NO}}$

9) HOW WAS WELL DEVELOPED?
$\boxed{\text{BAILING}}$ PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., $\boxed{\text{30 min.}}$ OTHER ________

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
$\boxed{\text{5 gal.}}$ 10 gal., 15 gal., OTHER ________

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, $\boxed{\text{OPAQUE}}$

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, $\boxed{\text{TURBID}}$ OPAQUE

14) DID THE WATER SMELL? YES OR $\boxed{\text{NO}}$

15) WATER LEVEL SUMMARY

1) DEPTH FROM T STANDPIPE AFTER DEVELOPMENT?
35.3 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

Well No. 4 DATE INSTALLED 03-13-86 DRILL RIG CME 45

DRILLER John Wright DRILL CREW Ron Lucian

JOB/CLIENT Menasha Paper STS JOB No. 1073

FW 1 983

MEN01730

PEERLESS-MIDWEST, INC. Water Supply Contractors
51255 BITTERSWEET ROAD/GRANGER, INDIANA 46530/219 272-9050

WELL & PUMP SERVICE INSPECTION REPORT

OWNER Menasha Corporation

CITY Otsego STATE Michigan

WELL NO. 5 LOCATION 12' E. of Loading Dock & 10' S. of RR

DIA. 30" x 12" DEPTH 76' TYPE WELL Gravel Wall

SCREEN ID 12" SCREEN LENGTH 15' DEPTH TO TOP OF SCREEN 61' TYPE SCREEN SSWW

DATE DRILLED 1970 DATES OF CLEANING 1971,73,74,76,78,80,82,83

DATE INSPECTED 2-3-84 PERSON TO CONTACT Ron Thaxton

CONTACT LOCATION At Plant PHONE 616-692-6141

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1970	26'	500	69'		11.6
AFTER LAST CLEANING	1983	23'	257	55'		8.0
AFTER LAST TEST	1983	23'	271	68'	100#	6.0
PRESENT AT LINE PRESSURE	1984	23'	257	62'	104#	6.5

TEST WILL BE COMPLETE THROUGH: TOP OF CHECK ____ METER ____ FLANGE OR ~~XXXXX~~ SIZE 6"

TOTAL PUMP SETTING 74½' MOTOR H.P. 40 GEAR DRIVE ____ VOLTS 440 RPM 1760

PUMP MFG. Layne/Floway SERIAL NUMBER 63962 AIRLINE LENGTH 73'

RATED CAPACITY: 500 G.P.M.; 247' T.D.H.; OPERATING PRESSURE ____

DATE INSTALLED 1970 DATES OF OVERHAUL 1976,81

IS CHECK VALVE LEAKING? YES ___ NO X DOES STUFFING BOX HAVE SPRINGS? No SIZE OF PACKING 3/8"

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION:

CHANGE MOTOR OIL & GREASE X REPACK PUMP X GREASE PUMP X

RPM METER REQUIRED No

PUMP IS PRESENTLY DEVELOPING 257 GPM 302' TDH; PROJECTED CURVE CAPACITY 500 GPM 240' TDH

ELECTRICAL DATA WITH PUMP IN OPERATION 33-33-34 AMPS; 460 VOLTS; 3 PHASE

MATERIALS NEEDED TO CLEAN WELL: Drop out 6" tee, two 6" elbows, three hoses to tank and 10' to waste.

NEED A SMEAL TO RAISE PUMP? No REMARKS: Motor is screened. Used one 160# pressure gauge and one 1/4" petcock.

INSPECTED BY Russell E. Buck

PEERLESS-MIDWEST, INC. Water Supply Contractors
51255 BITTERSWEET ROAD/GRANGER, INDIANA 46530/219 272-9050

WELL & PUMP SERVICE INSPECTION REPORT

OWNER Menasha Corporation

CITY Otsego STATE Michigan

WELL NO. 4 LOCATION 12' N. of Corner of Building & 100' S. of River Street

DIA. 34" x 16" DEPTH 87' TYPE WELL Gravel Wall

SCREEN ID 12" SCREEN LENGTH 25' DEPTH TO TOP OF SCREEN 62' TYPE SCREEN Red Brass

DATE DRILLED 1967 DATES OF CLEANING 1969,71,72,73,74,76,78,80,82

DATE INSPECTED 2-3-84 PERSON TO CONTACT Ron Thaxton

CONTACT LOCATION At Plant PHONE 616-692-6141

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1967	21'	1001	67'	110#	21.7
AFTER LAST CLEANING	1982	20'	361	50'	105#	12.0
AFTER LAST TEST	1983	17'	402	56'	100#	10.3
PRESENT AT LINE PRESSURE	1984	20'	372	57'	103#	10.0

TEST WILL BE COMPLETE THROUGH: TOP OF CHECK ______ METER ______ FLANGE OR ~~THREAD~~ SIZE 8"

TOTAL PUMP SETTING 81' MOTOR H.P. 75 GEAR DRIVE ______ VOLTS 220/440 RPM 1800

PUMP MFG Layne/Floway SERIAL NUMBER 58516 (79-10099) AIRLINE LENGTH 72'

RATED CAPACITY: 600 G.P.M.; 247' T.D.H.; OPERATING PRESSURE -

DATE INSTALLED 1968 DATES OF OVERHAUL 1974,78

IS CHECK VALVE LEAKING? YES ___ NO X DOES STUFFING BOX HAVE SPRINGS? No SIZE OF PACKING 3/8"

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION:

CHANGE MOTOR OIL & GREASE X REPACK PUMP X GREASE PUMP X

RPM METER REQUIRED No

PUMP IS PRESENTLY DEVELOPING 372 GPM 294' T.D.H.; PROJECTED CURVE CAPACITY 600 GPM 258' TDH

ELECTRICAL DATA WITH PUMP IN OPERATION 53-54-54 AMPS; 360 VOLTS; 3 PHASE

MATERIALS NEEDED TO CLEAN WELL: Come off 8" head with elbow, one hose to tank and 40' to waste.

NEED A SMEAL TO RAISE PUMP? No REMARKS: Motor is screened. One 8" gasket.

INSPECTED BY Russell E. Buck

MEN01732

PEERLESS-MIDWEST, INC. *Water Supply Contractors*
51255 BITTERSWEET ROAD / P. O. BOX 26 / GRANGER, INDIANA 46530 / 219 272-9050

July 31, 1986

Menasha Corporation
Paperboard Division
Otsego, MI 49078

Attention: Mr. Ron Thaxton

Re: Proposed Interceptor Well

Dear Ron:

This will review our meeting of July 31, 1986 along with John Bonham, regarding the possibilities of a well in the area of the East Truck Dumper near the chip pile.

The report of STS Consultants on the hydraulic oil in the area was reviewed. This does not appear to have been a serious spill. The oil that has leaked in here is apparently confined in the soils above the static water level. It is, however, anticipated that they will eventually be "washed" down into the water bearing zone.

Your engineers have presented four (4) remedial alternatives. A fifth possibility is the installation of a mill water supply well here which would also serve as an interceptor of any VOC's that might enter the aquifer.

We do point out that existing wells #4 and #5 would most likely also accomplish this interception, however, the mill is presently in need of additional water supplies and a much more positive job can be accomplished by an interceptor well located in the center of the plume.

The first step in determining whether or not a well can be located here would be a test drilling. We propose a test well to the bottom of the water bearing formations, estimated at 90'. Geologist would be on site for soil classification and the conducting of a gamma ray log. 4" screen and casing would be set and the well pumped for water samples. Complete water analysis, including VOC, would be provided. Our geologist would then provide a report estimating yield from the site and recommending proper well design. Price for this work would be --- $2,965.00.

Assuming satisfactory water bearing formations are present at this site, a final step would be required to answer the questions as to whether or not a well at this location will in fact accomplish the desired interception job. An aquifer performance analysis test would be conducted, operating existing wells #4 and #5 on a controlled pumpage basis, while water levels are observed in the test well and the four existing monitoring wells.

With this data, our hydrogeologist can then determine safe yield from the new well, cone of influence and interference with existing wells #4 and #5.

Cost of this test and report by hydrogeologist would be --- $2,875.00.

We would appreciate your order for the above work and if there should be further questions, would be pleased to meet at any time.

Very truly yours,

PEERLESS-MIDWEST, INC.

Don Huber

Don Huber

DH:nls

cc: Mr. John Bonham

FORM 561

MEN01734

memo / MENASHA CORPORATION

TO: Distribution

DATE: August 11, 1986

SUBJECT: Hydraulic Oil Contamination in Chipyard

FROM: John Bonham

There will be a follow-up meeting on Tuesday, August 26, at 2:00 PM in the main conference room to discuss the oil contamination problem around #2 truck dumper. At the last meeting, some people were designated to investigate several possibilities.

1. Environmental feasibility of a well near the problem site. (Bonham)
2. Feasibility of new mill water supply well near the problem site. (Clemmons)
3. If a well is installed, should we stop or encourage water percolation through soil? (Bonham)
4. Cost to change most of hydraulics to electric motors. (Hartman)
5. New screening/unloading alternatives. (Heibel)

Please be prepared to discuss the above items at the next meeting.

Thanks.

Distribution:
B. Buchanan
Mike Carlson
Jim Porter
Larry Heibel
Ken Hartman
S.J. Rosenthal
Tom Clemmons
John Blauwkamp
Sandra Jones

kj

MENASHA CORP., Paperboard Division

JOB ORDER

IS IT SAFE?

Job No.

Account No.

MEN01735

Class		
	Department Technical	Date Written 10-21-86
	Area Chip Yard	Date Wanted 10-31-86
	Equip. No. and Name Test wells	Date Completed

WORK NEEDED

Two test wells put in chip yard by #2 truck dumper have been broken off. Please cap these about 2 feet below ground level and put a permanent marker at ground level to mark them. See Gary Kays for location of wells.

Development Job Authorization	Authorized By	Written By
Mgr.	Supt.	TTB

Labor	Est.	Actual	Costs	Est.	Actual	Engineering Endorsements
No. Men			Labor			
			Material			P.O. Nos.
Total M.H.			Total			

RETURN THIS ORDER TO MAINTENANCE SUPERVISOR WHEN WORK IS DONE

FORM 561

MEN01736

memo / CORPORATION

TO: Chip Yard Operators

DATE: December 9, 1986

SUBJECT: Roadway Salting

FROM: Jim Porter

Recent groundwater testing in the chipyard shows that higher than normal amounts of chlorides exist around the #2 truck dumper area. This can be explained by the abundant use of salt on the approach ramp to this dumper in previous years.

We all recognize that salt is necessary at times to keep the ramp free of ice so our trucks can make it up. The amount of salt used however must be minimized. Please do what is required to spread by hand the minimum amount needed to do the job. Do not try to spread with the front end loader or Bobcat as far too much salt usage will result.

Your cooperation is appreciated!

cc: M. Carlson
J. Bonham
M. Reed
Shift Supervisors
LBX Books (9)

/kj

MEN01737

MENASHA CORPORATION
PAPERBOARD GROUP

December 15, 1986

Galen Kilmer
Department of Natural Resources
Ground Water Section
621 10th St.
Plainwell, MI 49080

Dear Galen:

Recently Menasha Corporation began to suspect that hydraulic oil leaks around the #2 truck dumper in the chipyard could be significant enough to pose a potential soil contamination problem. This truck dumper was installed approximately 5 years ago, with a number of hydraulic lines running to various motors and lift cylinders. Due to periodic leaks, Menasha came to realize that an investigation should be done to determine whether in fact the hydraulic oil had leaked into the ground enough to present an environmental problem.

STS Consultants was retained to assess the vertical and horizontal extent of soil and potential groundwater contamination around #2 truck dumper. Four soil borings were done, ranging from 34 feet to 41.5 feet deep. Monitoring wells were installed at three of the four boring locations. MW-1 is on the west side of the truck dumper, MW-2 is on the east side of the truck dumper, and MW-4 is south of the truck dumper. A water quality analysis was done on samples from all three wells. Water samples were checked for VOC's, chlorides, sodium, and calcium. Analysis for VOC's was done using gas chromatography methods, EPA No. 601 and 602. The results are summarized in the attached Tables 3 and 5.

The horizontal extent of contamination was estimated using 3 geophysical methods: electrical resistivity, electromagnetics, and photo-ionization detection (this last method proved to be ineffective for hydraulic oil). A major conductive anomaly was identified approximately 250 feet south of MW-1. To explore this feature, MW-4 was located in the center of this anomaly. The water sampling previously mentioned showed elevated levels of calcium, sodium, and chlorides.

Lastly, an oil and grease analysis was performed on the two soil borings nearest the truck dumper. The results of this analysis are summarized in Table 4. A pure sample of the hydraulic oil in question was finger printed using gas chromatography methods. This allowed the contamination in the soil to be positively identified as hydraulic oil from the truck dumper.

OTSEGO MILL BOX 155 • 320 N. FARMER STREET • OTSEGO, MICHIGAN 49078 • PHONE: 616-692-6141

It is evident that several plumes of oil are suspended in the soil strata. It also appears that local geology has favored movement towards well MW-1, as evident by the higher levels of contamination in this well, caused by the coarser sand and gravel in the first 9.5 feet of this well. Relatively low levels of oil and grease were evident in the soil below the measured water table, and no trace of volatile organic compounds above 1 ppb was observed in any of the well samples.

The high calcium, sodium, and chlorides which were discovered in the water sample from MW-4 are believed to be caused by the use of salt in the winter to reduce ice build-up on the approach to the truck dumper.

The prevailing groundwater flow in this area appears to be from the northeast to the southwest. Therefore, the aquifer under #2 truck dumper flows toward the mill. To determine the impact that our mill supply wells have on the groundwater in this area, the level of MW-1 was checked both with and without Menasha's #4 well on. The groundwater level dropped 1'-11" when the well was on. Since #4 well runs continuously, it appears that if any oil did reach the groundwater, it would be captured and run through our mill process, thus containing the problem.

Menasha has already taken a number of steps to address the contamination problem. Engineering is in progress to design a large containment area which will prevent any future leaks from entering the soil. Current plans are to construct this containment area during 1987. Fittings on the hydraulic lines have already been replaced with a type that is more leak resistant.

Methods of de-icing the approach to the truck dumper are being re-evaluated to reduce the likelihood of further salt contamination in the soil.

Menasha also intends to further investigate the chipyard to evaluate whether or not #4 and #5 mill supply wells are adequate to serve as permanent interceptor wells for this area. Initial data indicates that this is a good possibility.

In summary, Menasha has discovered hydraulic oil contaminating the soil under the #2 truck dumper. Although some oil has reached the level of the groundwater table, there is no evidence that the groundwater has been contaminated. In addition, existing mill supply wells have a demonstrated draw down area sufficient to capture any oil which might migrate into the water. Menasha is also in the process of designing a containment area to prevent any future hydraulic leaks from contacting the soil.

The elevated calcium, sodium, and chloride levels found in groundwater samples will also be captured by existing mill wells. Further studies of the area are being planned to insure that any remedial actions taken are appropriate and effective.

The MDNR will be kept fully informed by Menasha on progress in this matter. If you have any questions or concerns, please contact me. If desired, a meeting can be set up to discuss this issue in more detail.

Sincerely,

Otsego Paperboard Division

John T. Bonham
Technical Manager

cc: J. Blauwkamp
S. Jones
K. Kling

/kj

TABLE 3
MENASHA CORPORATION
INVESTIGATION OF HYDRAULIC OIL SPILL
WATER QUALITY ANALYSIS

Water Quality Parameter	MW-1	MW-2	MW-4
*p.p.m.			
**Volatile Organic Compounds	N/D	N/D	N/D
Chloride	85	70	310
Calcium	360	690	940
Sodium	50	15	180

*Milligram/liter unless noted.
**Detection limits microgram/liter.
N/D = no response over detection limits of 1 microgram/liter.

TABLE 4

MENASHA CORPORATION

INVESTIGATION OF HYDRAULIC OIL SPILL

OIL AND GREASE ANALYSIS OF SOIL SAMPLES (Mg/Kg)

Depth	Surface Elevation MW-1 92.7	MW-2 94.5
0 - 1.5	58	1800
2.5 - 4	13	210
5 - 6.5	8700	71
7.5 - 9	8200	170
10 - 11.5	26	19
12.5 - 14	31	-
15 - 16.5	350	< 5
17.5 - 19	22000	-
20 - 21.5	11000	19
22.5 - 24	-	-
25 - 26.5	- *	11*
30 - 31.5	68	5
32.5 - 34	9	-

- Denotes no sample

* Approximate water depth on 4-10-86

** Detection limits 5 mg/kg.

MEN01742

TABLE 5
MENASHA CORPORATION - HYDROGEOLOGIC STUDY
MONITORING WELL WATER QUALITY
VS.
NATIONAL DRINKING WATER STANDARDS

ıter Quality ırameter ıg/l)	National & Secondary Drinking Water Standards mg/l	Normal** Constituents in Groundwater	Well #1	Well #2	Well #4
ıloride	250	10-1000	85	70	310
ılcium	250*	<100	360	690	940
›dium	-	<200	50	15	180

ʀecommended Limit - not enforceable.
'Reference 6
'*Reference 7

6-22-87

MEN01743

Note To File

On June 19, 1987, STS Consultants notified Menasha that samples of water from the west and east monitoring wells at the #2 truck dumper had 1½' and ½" respectively of free oil product on the water's surface. Sue Schweikart of the MDNR was notified at 5:00 p.m. on June 19. Menasha informed her that we would investigate further and talk to her again in about 1 week. John Blauwkamp and myself were present.

On June 22, Gary Roys sampled the west well, obtaining about ¼" of free product with the initial sample, and slightly less than this after bailing 3 times.

On June 26, Sue Schweikart was notified of this follow-up test, and Menasha's general investigation of other areas. She stated that after our investigation was done, they would probably expect us to come up with our own remediation plan.

MEN01744

Project

Groundwater Investigation
Otsego, Michigan
Summary of Findings

Client

Menasha Corporation
320 N. Farmer Street
Otsego, MI 49708-0155

Project # 1123XF .

Date July 21, 1987

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

July 21, 1987

Mr. John Bonham
Menasha Corporation
Otsego Paper Board Plant
320 N. Farmer Street
P.O. Box 155
Otsego, MI 49708-0155

RE: Groundwater Investigation, Otsego, Michigan
SUMMARY OF FINDINGS

Dear Mr. Bonham:

STS Consultants, Ltd. has completed a subsurface exploration program, performed to aid in determining the extent of groundwater contamination at Menasha Otsego Paper Board Plant. Work for this project has been completed under authorization of your purchase order number 4816539. This technical memorandum serves to summarize our findings during Phase I of this project, and sets forth recommendations regarding further engineering analysis necessary to develop plans for implementing remedial action.

1.0 FIELD EXPLORATION

The subsurface exploration program consisted of performing soil borings utilizing truck mounted drilling equipment and hand auger tools. The following sections summarize boring procedures and subsurface conditions.

1.1 Drilling Operations

STS Consultants. Ltd. mobilized a CME-55 truck mounted drill rig to perform 4 soil borings for the subsequent installation of groundwater monitoring wells at the Otsego site. The borings were advanced using hollow stem augers. and representative soil samples were obtained with split barrel samplers. Sampling was conducted at 2.5 foot intervals in general accordance with ASTM specification D-1586.

Prior to the commencement of drilling operations, clean protocol was initiated to minimize cross-hole and cross-sample contamination. This entailed steam cleaning the drill rig, drilling equipment, sampling tools. and well supplies. Furthermore, the split barrel sampler was washed with trisodium phosphate between each sampling event.

All samples collected during the drilling operation were later scanned with an HNU-Model 101 Photo-ionizer at the STS office in Lansing, Michigan. The photo-ionizer is a portable truce gas analyzer used to measure relative concentrations of various organic vapors. Meter readings from this detector can be interpreted to a level of 1 part per million (ppm) or the existing background readings, whichever is greater. Results of this testing indicated that no soils collected during the drilling operation contained volatile organic vapor levels above ambient levels. However, analytical testing conducted on some of the samples of the samples indicated the presence of a hydrocarbon contaminant. Analytical testing will be discussed under Laboratory Analyses.

At the conclusion of each boring, 2 inch PVC monitoring wells with 10 feet of number 10 slot screen were installed in each borehole, with the exception of Boring MW-8. Because of the presence of large gravel and cobbles in the area of Boring MW-8. drilling was terminated at a depth of approximately 28 feet due to auger refusal. Geology over most of the site, however, consisted of fine to coarse sand and sandy gravel. The enclosed soil boring logs and well installation diagrams supply detailed subsurface conditions and well installation information.

1.2 Hand Augers

On July 16, 1987, an STS engineer utilized a hand auger to perform 4 soil borings located approximately 10 feet east of the fuel distribution building on the northwest portion of the site. These borings were conducted in an attempt to obtain soil samples for volatile organic vapor testing. However, gravelly soils prevented three of the borings from being extended past a depth of 1 foot. The fourth boring was successfully extended to 4.5 feet below ground surface. Table 1 presents hand auger designation and volatile organic vapor levels as determined with an HNU-Model 101 photo-ionizer. STS will be mobilizing a crew to complete this hand auger investigation under the current contract for services.

TABLE 1
Hand Auger Photo-ionization Detection

Hand Auger Designation	Depth of Sample (ft)	HNU-PID* (ppm)
HA-1	0.0-1.0	4
HA-1A	No sample	-
HA-2	0.0-1.0	50
HA-2A	0.0-1.0	15
	1.5-2.0	10
	2.0-2.5	15
	2.5-3.0	4
	3.0-3.5	20
	4.0-4.5	10

* HNU Photo-ionization Detection

1.3 Land Survey

STS Consultants performed a land survey on May 21, 1987, to obtain horizontal and vertical control of previously installed monitoring wells. Pertinent well elevation and groundwater elevatons are presented in Table 2. Based on this information, groundwater appears to generally be flowing southwest (S30° W).

TABLE 2
Pertinent Elevation

	Elevation (ft)		
Well	Top of Pipe	Ground Surface	Groundwater
MW-1	92.30	92.3	65.10
MW-2	93.47	93.5	65.36
MW-5	97.06	98.2	60.39
MW-6	98.16	97.1	60.39
MW-7	64.65	72.8	55.75
B-8	92.45	92.5	N/S
MW-9	90.81	88.4	N/S
MW-10	90.73	88.6	N/S

N/S = Not Sampled

2.0 LABORATORY ANALYSES

2.1 Groundwater Quality

On June 18, 1987, STS Consultants obtained groundwater samples for laboratory analyses. Snell Environmental Laboratories (SEG) of Lansing, Michigan, was retained by STS to perform testing on samples obtained from monitoring wells MW-1, MW-2 and MW-5 through MW-7. Analyses was conducted for the following parameters: EPA 601 and 602 volatile organic scans, oil and grease, chloride, Chemical Oxygen Demand (COD), specific conductivity, and pH.

Results of this testing did not indicate the presence of any halogenated or aromatic hydrocarbons for a detection level of 1 ppm, as tested in the EPA 601 and 602 scans, respectively. However, groundwater obtained from monitoring well MW-1 indicated 1300 (mg/l) part per million oil and grease. Furthermore, the STS sampling crew observed 6 inches of free product on the surface of the water obtained from MW-1. The COD value of 470 mg/l also appears at a relatively higher value due to the oil and grease concentrations. Finally, although the STS sampling crew noted a slight film on the surface of water obtained from monitoring well MW-2, the oil and grease value determined during analytical testing, was below the detection limit of 1 ppm. This result is being reviewed by the testing laboratory.

The oil and grease analysis of MW-7 show the presence of 2.0 ppm of oil and grease.

2.2 Analytical Soil Testing

Selected soil samples obtained during the drilling operation were forwarded to SEG Laboratories of Lansing, Michigan for oil and grease analysis. Table 3 presents soil sample designations, depth of sampling, and oil and grease concentrations. Analytical results as presented by SEG Laboratories is enclosed in the Appendix.

TABLE 3
Analytical Soil Analysis

Soil Boring	Depth of Sample (ft)	Oil and Grease (mg/kg)
MW-5	2.5-4.0	5120
#1 Truck Dumper	5.0-6.5	1650
	20.0-21.5	<50
	35.0-36.5	145
	37.5-39.0	105
MW-6	5.0-6.5	97
Underground Fuel Tank	10.0-11.5	<50
	20.0-21.5	<50
	32.5-34.0	<50
	37.5-39.0	<50
MW-7	10.0-11.5	225
South of Mill	12.5-14.0	<50

3.0 PRELIMINARY RESULTS AND RECOMMENDATIONS

STS Consultants, Ltd. has completed preliminary subsurface exploration and analytical testing at Menasha's Otsego Plant. Results of these investigations indicate groundwater contamination near the east truck dumper and at MW-7. Furthermore, surficial soil testing with a photo-ionizer near the fuel building indicated the presence of volatile organics. Soil contamination has been found at the west truck dumper and MW-6 and MW-7.

STS recommends to proceed with Phase II of this project and all work has been completed on Phase I. Phase II entails further engineering analysis of the previously discussed data, and developing remedial action plans to limit further contaminant migration.

We trust this technical memorandum communicates the status of the project to date and the direction in which we recommend the project to proceed. If you have any questions regarding its contents, please do not hesitate to call.

Sincerely,

STS CONSULTANTS, LTD.

Bernard B. Sheff, EIT
Geo-Environmental Group Manager

BBS/pls MLY3 #6

MEN01752

Appendix

MEN01753

SEG LABORATORIES, INC.

Revised report of June 19, 1987

June 26, 1987

STS Consultants, LTD.
3340 Ranger Road
Lansing, MI 48906

Attn: Mark Yaskanin

Analytical results for samples submitted by STS Consultants, LTD., Lansing, MI, received by SEG Laboratories, Inc., on May 22, 1987

PO#: Verbal

SEG Number:	70080	70081	70082
Tag:	Job #1123XF MW-5 Sample #2 2.5'-4.0'	Job #1123XF MW-5 Sample #3 5.0'-6.5'	Job #1123XF MW-5 Sample #9 20.0'-21.5'
Total Solids %	89.2	89.2	97.1
Oil & Grease mg/kg	5,120	1,650	<50
SEG Number:	70083	70084	70085
Tag:	Job #1123XF MW-5 Sample #15 35.0'-36.5'	Job #1123XF MW-5 Sample #16 37.5'-39.0'	Job #1123XF MW-6 Sample #3 5.0'-6.5'
Total Solids %	87.4	83.9	91.1
Oil & Grease mg/kg	145	105	97

1120 May Street, Lansing, Michigan 48906 • (517) 374-6800 • CABLE "SNELL" • TELEX 229458

STS Consultants
Analytical results continued
Attn: Mark Yaskanin
June 26, 1987
Page Two

MEN01754

SEG Number:	70086	70087	70088
Tag:	Job #1123XF MW-6 Sample #5 10.0'-11.5'	Job #1123XF MW-7 Sample #6 12.5'-14.0'	Job #1123XF MW-6 Sample #9 20.0'-21.5'
Total Solids %	95.3	89.9	97.4
Oil & Grease mg/kg	<50	<50	<50

SEG Number:	70089	70090	70091
Tag:	Job #1123XF MW-6 Sample #14 32.5'-34.0'	Job #1123XF MW-6 Sample #15 35.0'-36.5'	Job #1123XF MW-6 Sample #16 37.5'-39.0'
Total Solids %	96.5	90.5	87.3
Oil & Grease mg/kg	<50	<50	<50

SEG Number:	70092
Tag:	Job #1123XF MW-7 Sample #5 10.0'-11.5'
Total Solids %	86.9
Oil & Grease mg/kg	225

Approved by [signature]
Michael G. Goergen

MGG/bld

SEG LABORATORIES, INC.

July 7, 1987

STS Consultants, LTD.
3340 Ranger Road
Lansing, MI 48906

Attn: Ann Murray

Analytical results for well water samples submitted by STS Consultants, LTD., Lansing, MI, received by SEG Laboratories, Inc., on June 19, 1987.

PO#: Verbal

SEG Number:	70561	70562	70563
Tag:	Trip Blank	MW-1 1123XF 5:00 PM 06/18/87	MW-2 1123XF 4:30 PM 06/18/87
Chloride mg/L	-----	69	92
COD mg/L	-----	470	29
Oil & Grease mg/L	-----	1,300	<1
Conductivity umhos/cm	-----	960	1,270
pH	-----	6.3	6.7
PURGEABLE AROMATICS			
Benzene mg/kg	<1	<1	<1
Toluene mg/kg	<1	<1	<1
Ethyl Benzene mg/kg	<1	<1	<1
p-Xylene mg/kg	<1	<1	<1
m-Xylene mg/kg	<1	<1	<1
o-Xylene mg/kg	<1	<1	<1
Styrene mg/kg	<1	<1	<1

STS Consultants, LTD.
Analytical results continued
Attn: Ann Murray
July 7, 1987
Page 2

SEG Number:	70561	70562	70563
Tag:	Trip Blank	MW-1 1123XF 5:00 PM 06/18/87	MW-2 1123XF 4:30 PM 06/18/87
PURGEABLE HALOCARBONS			
Chloroethane mg/kg	<1	<1	<1
Trichlorofluoromethane mg/kg	<1	<1	<1
1,1-Dichloroethene mg/kg	<1	<1	<1
Methylene chloride mg/kg	<1	<1	<1
trans-1,2-Dichloroethene mg/kg	<1	<1	<1
1,1-Dichloroethane mg/kg	<1	<1	<1
Chloroform mg/kg	<1	<1	<1
1,1,1-Trichloroethane mg/kg	<1	<1	<1
Carbon tetrachloride mg/kg	<1	<1	<1
1,2-Dichloroethane mg/kg	<1	<1	<1
Trichloroethene mg/kg	<1	<1	<1
1,2-Dichloropropane mg/kg	<1	<1	<1
Bromodichloromethane mg/kg	<1	<1	<1
2-Chloroethylvinyl ether mg/kg	<1	<1	<1
cis-1,3-Dichloropropene mg/kg	<1	<1	<1
trans-1,3-Dichloropropene mg/kg	<1	<1	<1
1,1,2-Trichloroethane mg/kg	<1	<1	<1
Tetrachloroethene mg/kg	<1	<1	<1
Dibromochloromethane mg/kg	<1	<1	<1
Chlorobenzene mg/kg	<1	<1	<1
Bromoform mg/kg	<1	<1	<1
1,1,2,2-Tetrachloroethane mg/kg	<1	<1	<1
(m)-1,3-Dichlorobenzene mg/kg	<1	<1	<1
(p)-1,4-Dichlorobenzene mg/kg	<1	<1	<1
(o)-1,2-Dichlorobenzene mg/kg	<1	<1	<1

MEN01757

STS Consultants, LTD.
Analytical results continued
Attn: Ann Murray
July 7, 1987
Page 3

	#1 F.D.	Underground Fuel Tank	South of Mill
SEG Number	70564	70565	70566
Tag:	MW-3 1123XF 3:00 06/18/87	MW-6 1123XF 2:20-2:26- 2:30 06/18/87	MW-7 1123XF 3:30 3:39 06/18/87
Chloride mg/L	7.3	18	150
COD mg/L	15	7.5	27
Oil & Grease mg/L	<1	<1	2
Conductivity umhos/cm	530	630	1,380
pH	7.2	7.1	7.0

PURGEABLE AROMATICS

Benzene mg/kg	<1	<1	<1
Toluene mg/kg	<1	<1	<1
Ethyl Benzene mg/kg	<1	<1	<1
p-Xylene mg/kg	<1	<1	<1
m-Xylene mg/kg	<1	<1	<1
o-Xylene mg/kg	<1	<1	<1
Styrene mg/kg	<1	<1	<1

STS Consultants, LTD.
Analytical results continued
Attn: Ann Murray
July 7, 1987
Page 4

SEG Number	70564	70565	70566
Tag:	MW-5 1123XF 3:00 06/18/87	MW-6 1123XF 2:20-2:26- 2:30 06/18/87	MW-7 1123XF 3:30 3:39 06/18/87

PURGEABLE HALOCARBONS

Chloroethane mg/kg	<1	<1	<1
Trichlorofluoromethane mg/kg	<1	<1	<1
1,1-Dichloroethene mg/kg	<1	<1	<1
Methylene chloride mg/kg	<1	<1	<1
trans-1,2-Dichloroethene mg/kg	<1	<1	<1
1,1-Dichloroethane mg/kg	<1	<1	<1
Chloroform mg/kg	<1	<1	<1
1,1,1-Trichloroethane mg/kg	<1	<1	<1
Carbon tetrachloride mg/kg	<1	<1	<1
1,2-Dichloroethane mg/kg	<1	<1	<1
Trichloroethene mg/kg	<1	<1	<1
1,2-Dichloropropane mg/kg	<1	<1	<1
Bromodichloromethane mg/kg	<1	<1	<1
2-Chloroethylvinyl ether mg/kg	<1	<1	<1
cis-1,3-Dichloropropene mg/kg	<1	<1	<1
trans-1,3-Dichloropropene mg/kg	<1	<1	<1
1,1,2-Trichloroethane mg/kg	<1	<1	<1
Tetrachloroethene mg/kg	<1	<1	<1
Dibromochloromethane mg/kg	<1	<1	<1
Chlorobenzene mg/kg	<1	<1	<1
Bromoform mg/kg	<1	<1	<1
1,1,2,2-Tetrachloroethane mg/kg	<1	<1	<1
(m)-1,3-Dichlorobenzene mg/kg	<1	<1	<1
(p)-1,4-Dichlorobenzene mg/kg	<1	<1	<1
(o)-1,2-Dichlorobenzene mg/kg	<1	<1	<1

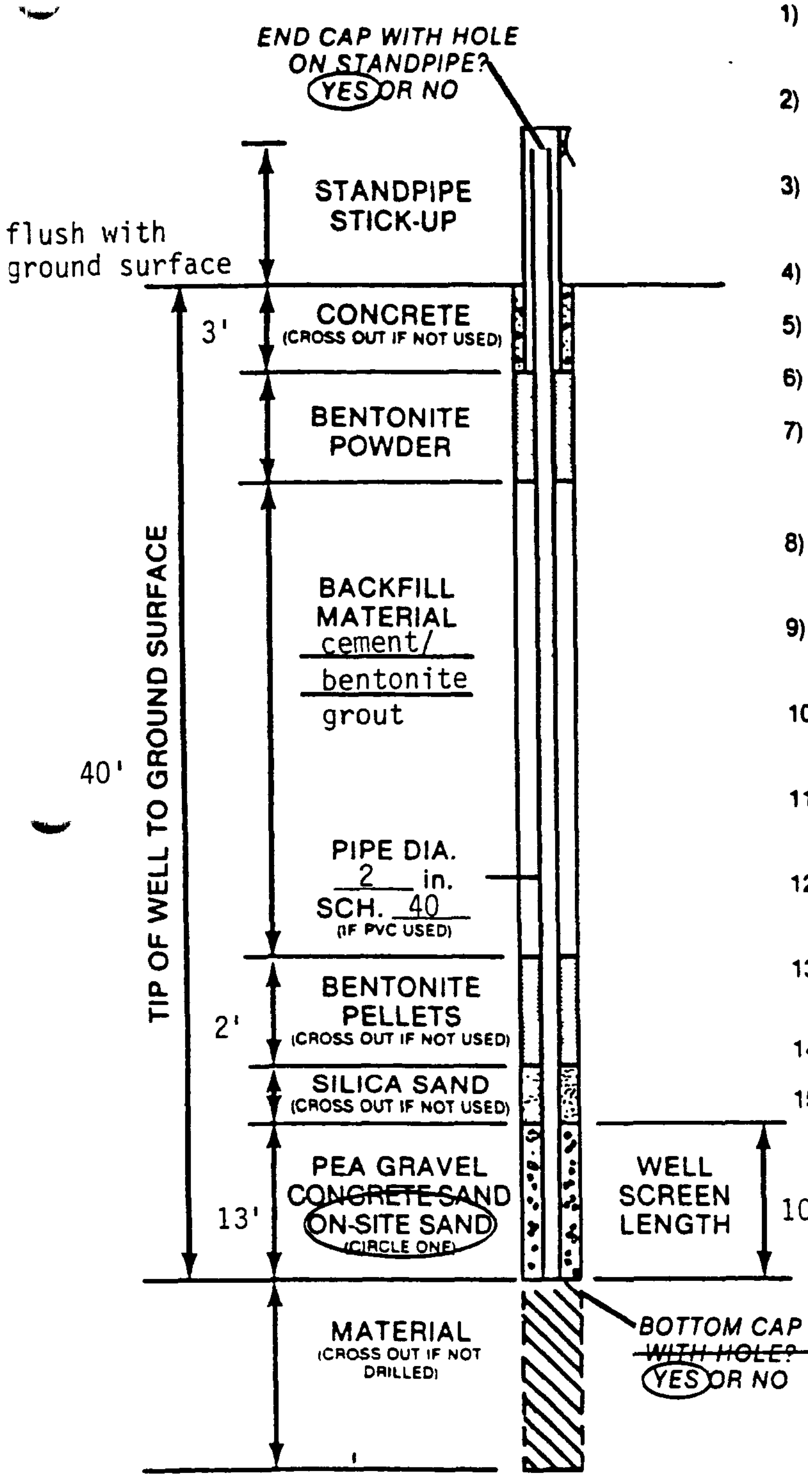
MGG/bld

Approved by Michael G Goergen (V.F.M)
Michael G. Goergen

STS Consultants Ltd.

MEN01759

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE #10 slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER ______

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER ______

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
40 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE 4-21-87, 35 Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

Well No. MW-5 DATE INSTALLED 4-21-87 DRILL RIG CME-55

DRILLER Brian P. DRILL CREW Brian P. - Bruce P.

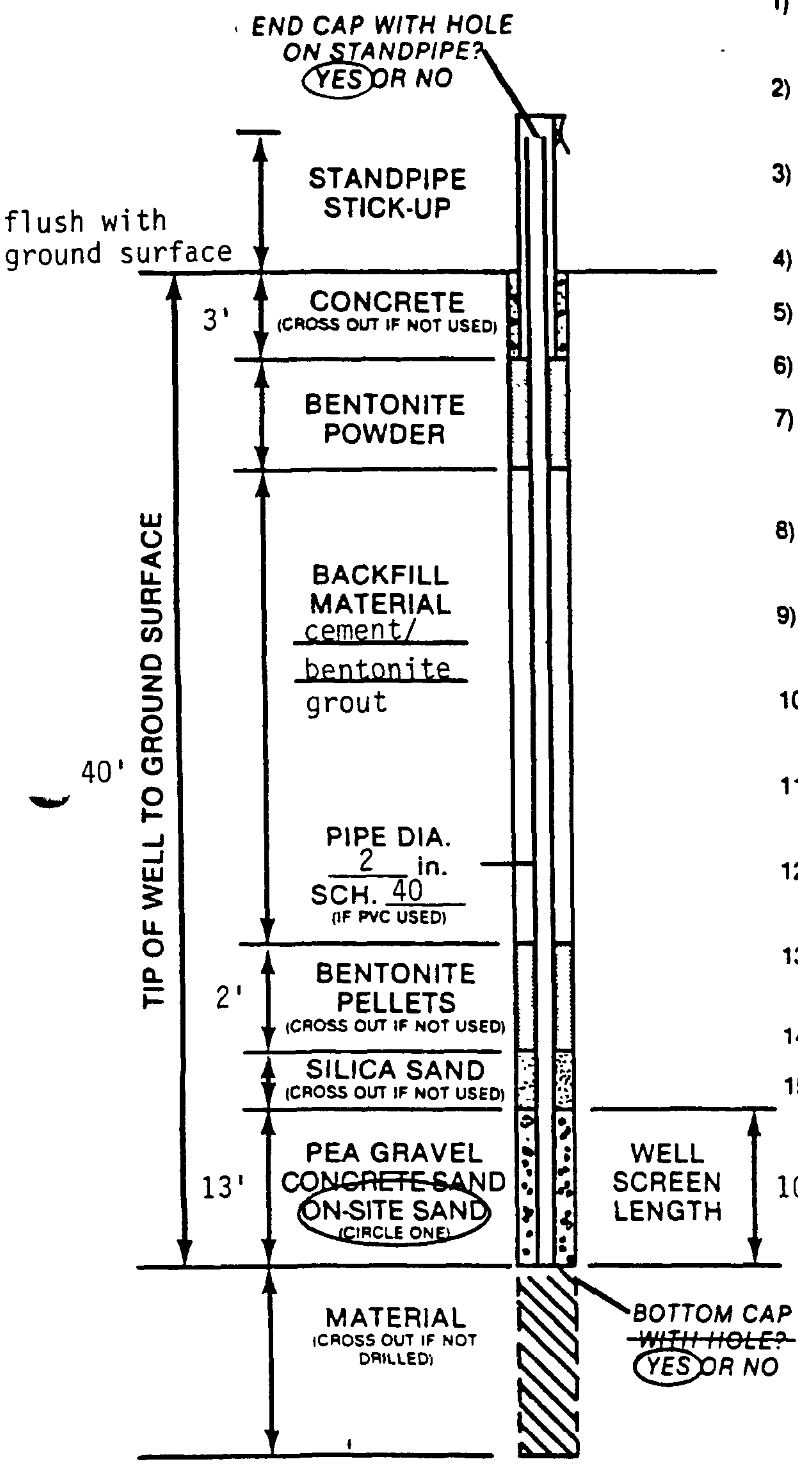
JOB/CLIENT Control System Study STS JOB No. 1123XF

FW. 1-983

STS Consultants Ltd.

MEN01760

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE #10 slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER ______

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER ______

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
35 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE 4-21-87, 35 Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

DATE ______, ______ Ft. FROM T, ST. PIPE

Well No. MW-6 DATE INSTALLED 4-21-87 DRILL RIG CME-55

DRILLER Brian P. DRILL CREW Brian P. - Bruce P.

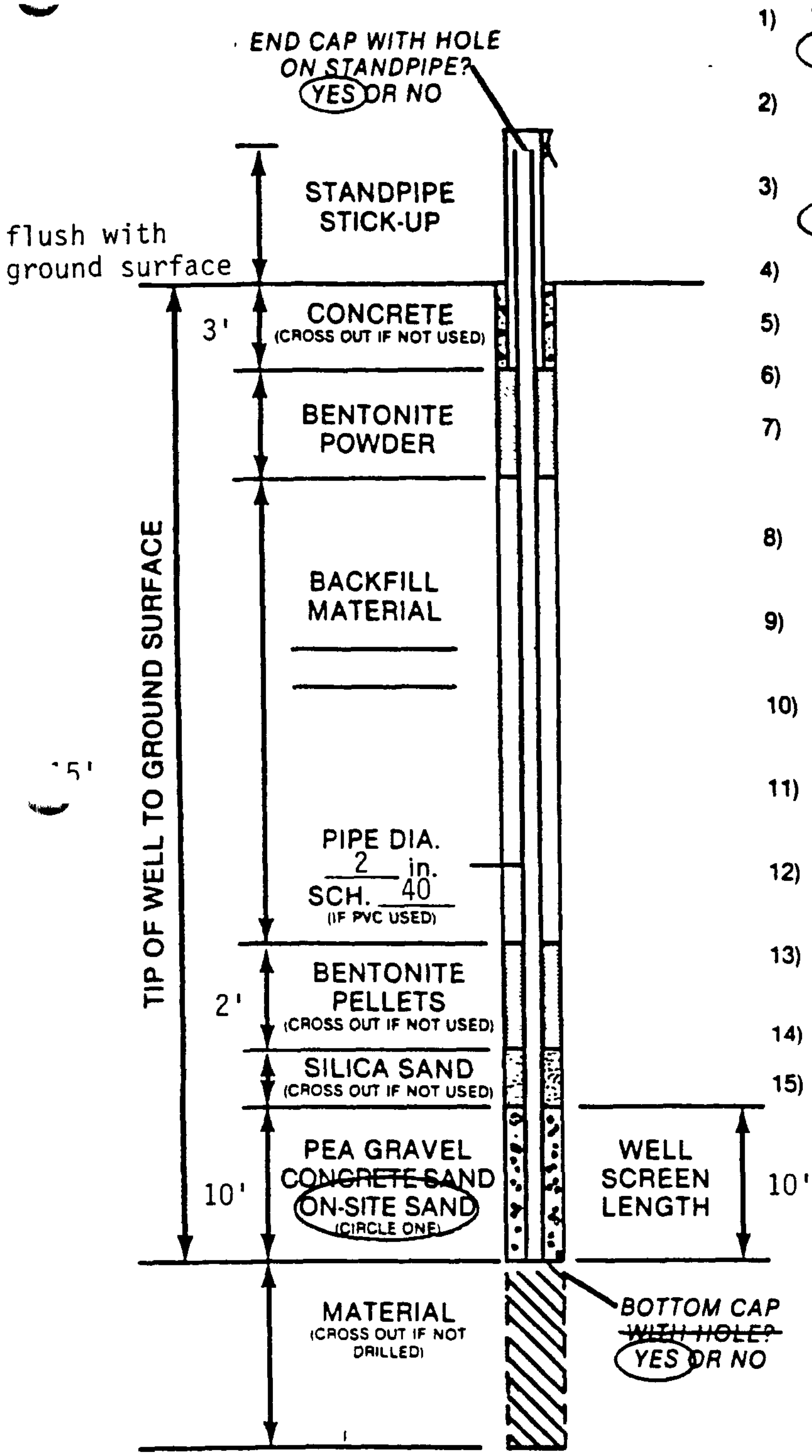
JOB/CLIENT Control System Study STS JOB No. 1123XF

FW: 1-983

STS Consultants Ltd.

MEN01761

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SIZE #10 slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER ________

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER ________

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
________ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

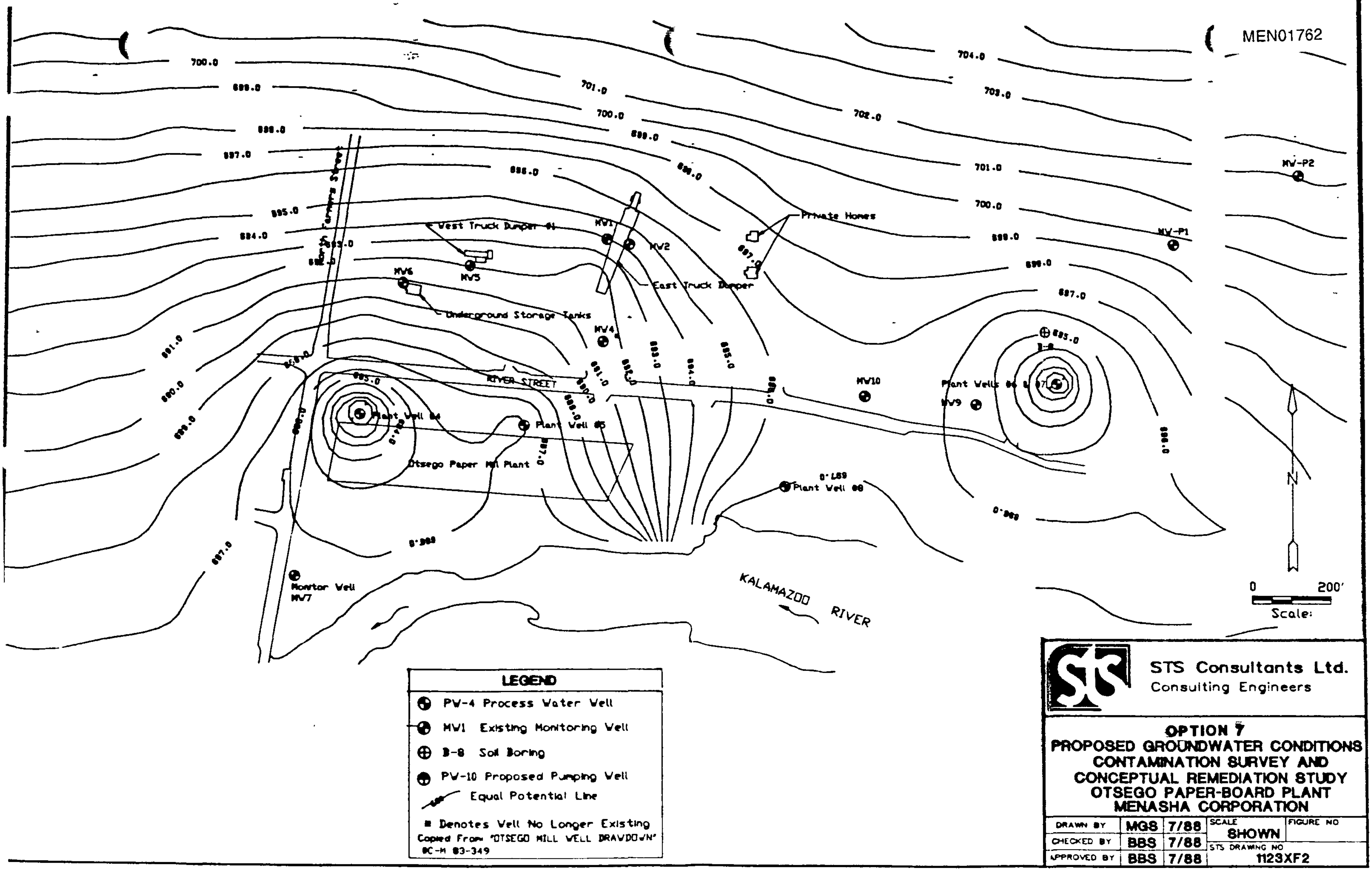
Well No. MW-7 DATE INSTALLED 4-21-87 DRILL RIG CME-55

DRILLER Brian P. DRILL CREW Brian P. - Bruce P.

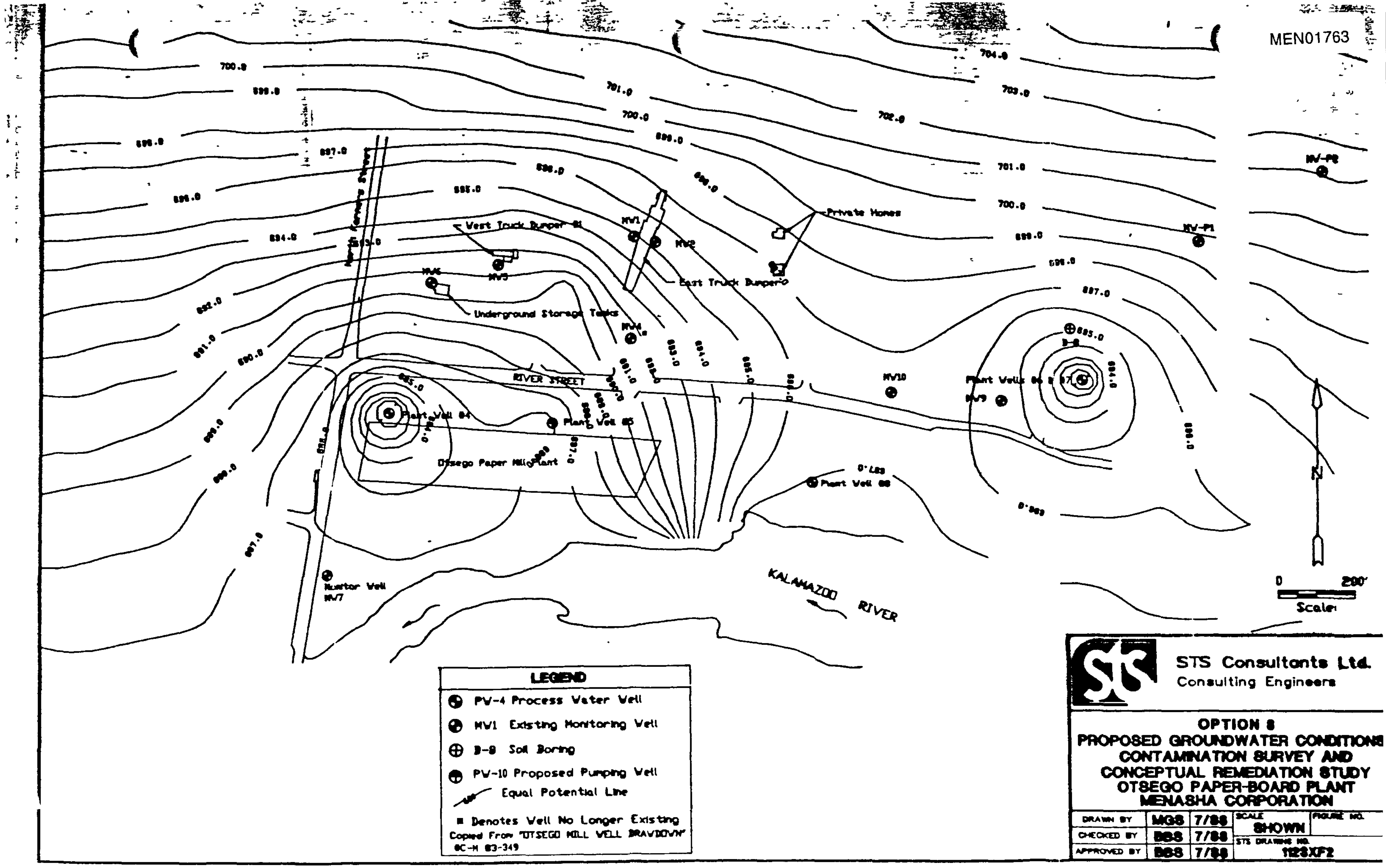
JOB/CLIENT Control System Study STS JOB No. 1123XF

FW: 1-983

MEN01762



North Farmers Street
RIVER STREET
West Truck Dumper #1
East Truck Dumper
Private Homes
Underground Storage Tanks
MW1
MW2
MW4
MW5
MW6
MW9
MW10
MW-P1
MW-P2
B-8
Plant Well #4
Plant Well #5
Plant Well #8
Plant Wells #6 & #7
Otsego Paper Mill Plant
Monitor Well
MW7
KALAMAZOO RIVER
N
0
200'
Scale:
LEGEND
PW-4 Process Water Well
MW1 Existing Monitoring Well
B-8 Soil Boring
PW-10 Proposed Pumping Well
Equal Potential Line
* Denotes Well No Longer Existing
Copied From "OTSEGO MILL WELL DRAWDOWN"
BC-M 83-349
STS Consultants Ltd.
Consulting Engineers
OPTION 7
PROPOSED GROUNDWATER CONDITIONS
CONTAMINATION SURVEY AND
CONCEPTUAL REMEDIATION STUDY
OTSEGO PAPER-BOARD PLANT
MENASHA CORPORATION
DRAWN BY MGS 7/88
CHECKED BY BBS 7/88
APPROVED BY BBS 7/88
SCALE SHOWN
FIGURE NO
STS DRAWING NO 1123XF2


MEN01763
Private Homes
West Truck Dumper #1
East Truck Dumper
Underground Storage Tanks
RIVER STREET
Plant Well #4
Plant Well #5
Plant Well #8
Otsego Paper Mill Plant
KALAMAZOO RIVER
Scale
LEGEND
PV-4 Process Water Well
MW1 Existing Monitoring Well
B-8 Soil Boring
PV-10 Proposed Pumping Well
Equal Potential Line
* Denotes Well No Longer Existing
Copied From "OTSEGO MILL WELL DRAWDOWN"
STS Consultants Ltd.
Consulting Engineers
OPTION 8
PROPOSED GROUNDWATER CONDITIONS
CONTAMINATION SURVEY AND
CONCEPTUAL REMEDIATION STUDY
OTSEGO PAPER-BOARD PLANT
MENASHA CORPORATION
DRAWN BY MGS 7/88
CHECKED BY BBS 7/88
APPROVED BY BBS 7/88
SCALE SHOWN
FIGURE NO.
STS DRAWING NO.

MEN01764

STS Consultants Ltd.	OWNER: Menasha Corporation	LOG OF BORING NUMBER: MW-5
	PROJECT NAME: Control System Study	ARCHITECT-ENGINEER

SITE LOCATION: Otsego, Michigan

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

SURFACE ELEVATION 98.2'

DEPTH	ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³	STANDARD PENETRATION BLOWS/FT.
		1	SS			Fine to coarse sand, little to some silt, little gravel, rusted metal fragments and organics-dark brown-loose to medium dense-moist. (Fill:SM) slight petroleum odor in samples 2 and 3.		9
		2	SS					11
5								
		3	SS					11
		4	SS			Fine to coarse sand, little silt, trace gravel-brown-loose-moist. (SM)		7
10								
		5	SS			Fine sand, trace silt-light brown-loose to extremely dense-moist. (SP) grading to saturated at 37.0'		9
		6	SS					16
15								
		7	SS					20
		8	SS					27
20								
		9	SS					30
		10	SS					27
25								

Continued on next page.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU. THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO 1123XF

BL: 2-0584

STS Consultants Ltd.

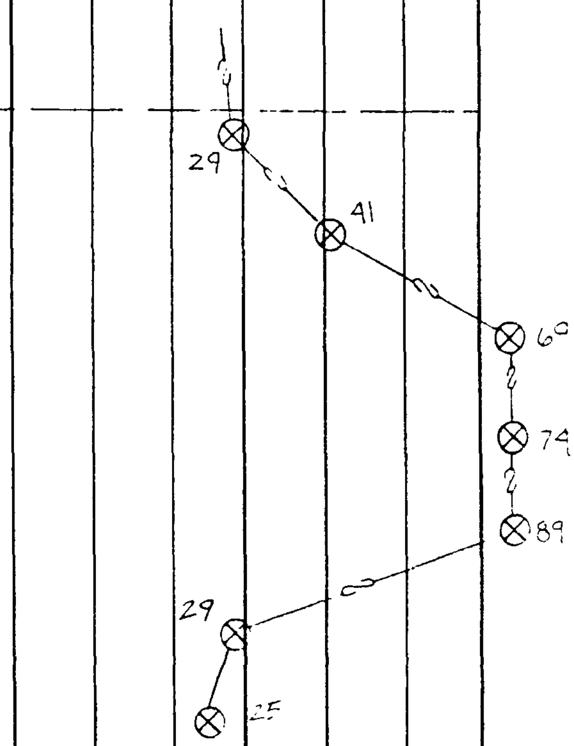
OWNER	Menasha Corporation
LOG OF BORING NUMBER	MW-5
PROJECT NAME	Control System Study
ARCHITECT-ENGINEER	
SITE LOCATION	Otsego, Michigan
SURFACE ELEVATION	98.2'

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² — 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % — 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT. — 10 20 30 40 50

DEPTH	ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
						Continued from previous page.	
25							
		11	SS			Fine sand, trace silt-light brown-loose to extremely dense-moist. (SP) grading to saturated at 37.0'.	
		12	SS				
30							
		13	SS				
		14	SS				
35							
		15	SS				
		16	SS				
40							
41.5		17	SS				
						END OF BORING Boring advanced to 40.0' using hollow stem auger. Monitoring well installed. See enclosed Well Installation Diagram.	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL 35' WD (WS OR WD)	BORING STARTED 4-20-87	STS OFFICE Lansing	
WL BCR ACR	BORING COMPLETED 4-21-87	DRAWN BY DTH	SHEET NO. 2 OF 2
WL	RIG CME-55 FOREMAN BP	APP'D BY WEH	STS JOB NO 1123XF

BL-1-0584

MEN01766

STS Consultants Ltd.

OWNER	Menasha Corporation
PROJECT NAME	Control System Study
SITE LOCATION	Otsego, Michigan
LOG OF BORING NUMBER	MW-6
ARCHITECT-ENGINEER	

SURFACE ELEVATION 97.1'

Depth	Sample No.	Sample Type	Description of Material	Unit Dry Wt. LBS./FT.³	Standard Penetration Blows/Ft.
	1	SS	Fine to coarse sand, little to trace gravel and silt, trace organics-brown-medium dense to very loose-moist. (Fill:SM-SP)		10
	2	SS			2
5					
	3	SS			4
	4	SS	Fine sand, trace to little silt, trace gravel, medium sand and organics-brown-loose-moist. (SP-SM)		5
10					
	5	SS			8
	6	SS	Fine sand, trace coarse sand, medium sand and silt-light brown-medium dense-moist. (SP)		16
15					
	7	SS			16
	8	SS			19
20					
	9	SS	Fine sand, trace silt-light brown-medium dense to very dense-moist. (SP) Grading to saturated at 34.5'.		36
	10	SS			45
25					
			Continued on next page.		

Legend: UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1, 2, 3, 4, 5); PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50); STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

SHEET NO 1 OF 2

STS JOB NO. 1123XF

BL: 2-0584

MEN01767

STS Consultants Ltd	OWNER: Menasha Corporation	LOG OF BORING NUMBER: MW-6
	PROJECT NAME: Control System Study	ARCHITECT ENGINEER:
SITE LOCATION: Otsego, Michigan		

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1, 2, 3, 4, 5)

PLASTIC LIMIT % (X) — WATER CONTENT % (●) — LIQUID LIMIT % (△): 10, 20, 30, 40, 50

STANDARD PENETRATION (⊗) BLOWS/FT: 10, 20, 30, 40, 50

SURFACE ELEVATION 97.1'

DEPTH	ELEVATION	SAMPLE NO	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT³	STANDARD PENETRATION BLOWS/FT
				Continued from previous page.		
25						
		11	SS	Fine sand, trace silt-light brown-medium dense to very dense-moist. (SP) grading to saturated at 34.5'		26
		12	SS			27
30		13	SS			58
		14	SS			60
35		15	SS			47
		16	SS			47
40						
41.5		17	SS			47
				END OF BORING Boring advanced to 40' using hollow stem auger. Monitoring well installed. See enclosed Well Installation Diagram.		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN SITU THE TRANSITION MAY BE GRADUAL

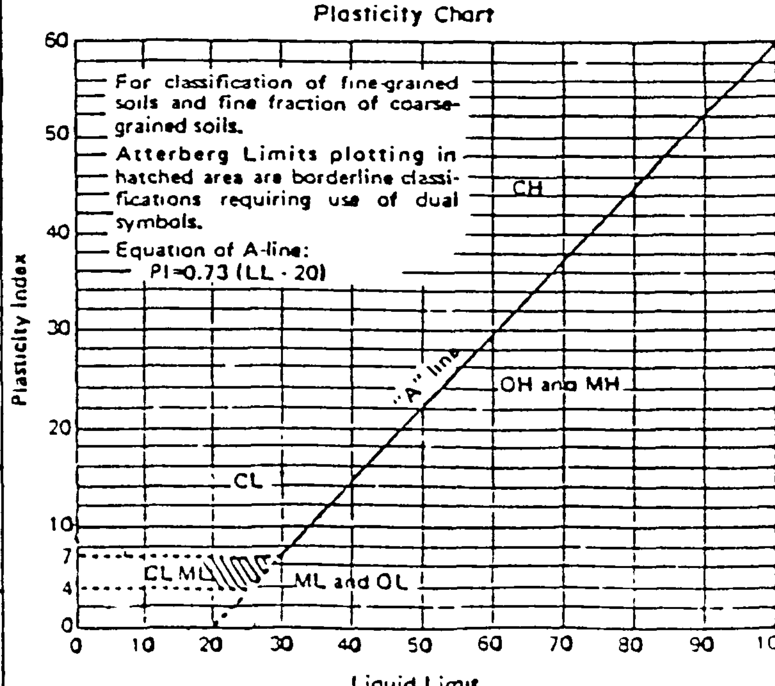
WL 35' WD (WS OR WD)	BORING STARTED 4-21-87	STS OFFICE Lansing	
WL BCR ACR	BORING COMPLETED 4-21-87	DRAWN BY DTH	SHEET NO 2 OF 2
WL	RIG CME-55 FOREMAN BP	APP'D BY WEH	STS JOB NO 1123XF

BL.1-0584

UNIFIED SOIL CLASSIFICATION SYSTEM

Major divisions			Group symbols		Typical names	Laboratory classification criteria		
Coarse-grained soils (... than half of material is *larger* than No. 200 sieve size)	Gravels (More than half of coarse fraction larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent .... GW, GP, SW, SP; More than 12 per cent .... GM, GC, SM, SC; 5 to 12 per cent .... *Borderline* cases requiring dual symbols	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM	d	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	d	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols.
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine grained soils (M... an half of material is *smaller* than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
Highly organic soils			Pt		Peat and other highly organic soils			

Plasticity Chart



MEN01769

STS Consultants Ltd.

OWNER	Menasha Corporation
LOG OF BORING NUMBER	B-8
PROJECT NAME	Control System Study
ARCHITECT ENGINEER	
SITE LOCATION	Otsego, Michigan
SURFACE ELEVATION	92.5'

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/FT 10 20 30 40 50

DEPTH	SAMPLE NO	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT³	STANDARD PENETRATION BLOWS/FT
	1	SS	Fine to medium sand, little gravel, trace to little silt, trace coarse sand and organics-brown-medium dense-moist. (Fill:SP-SM)		27
	2	SS			25
5	3	SS	Fine to medium sand, little to some gravel, trace silt, coarse sand-brown-loose to medium dense-moist. (SP)		8
	4	SS			20
10	5	SS	Fine sand, trace silt, coarse sand and gravel-brown-loose-moist. (SP) with occasional 1/4" sandy clay lenses.		9
	6	SS	Fine to coarse sandy gravel to gravelly sand, trace silt-brown-dense to very dense-dry to moist. (GW-SW) Driller's observation: Cobbles at 14.0' depth-very hard drilling.		48
15	7	SS			34
	8	SS			57
20	9	SS			31
	9A	SS	Fine to coarse sandy gravel, trace silt and clay-brown-very dense-moist. (GP)		23/6"
	10	SS			50
25	11	SS	Driller's observation: gravel and cobbles, auger refusal at 28.0'.		71
28			END OF BORING Boring advanced to 28' using hollow stem auger. Borehole backfilled with soil cuttings.		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL

WL Dry WS OR WD	BORING STARTED 4-16-87	STS OFFICE Lansing	
WL BCR ACR	BORING COMPLETED 4-17-87	DRAWN BY DTH	SHEET NO 1 OF 1
WL	RIG CME-55 FOREMAN BP	APP'D BY WEH	STS JOB NO 1123XF

BL.1-0584

MEN01770

STS Consultants Ltd.

OWNER	Menasha Corporation
LOG OF BORING NUMBER	MW-7
PROJECT NAME	Control System Study
ARCHITECT-ENGINEER	
SITE LOCATION	Otsego, Michigan

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1, 2, 3, 4, 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50)

SURFACE ELEVATION 72.8'.

DEPTH	ELEVATION	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS./FT.³	STANDARD PENETRATION BLOWS/FT.
		1	SS	Fine sand, little to some silt, trace gravel, coarse sand and organics-mottled brown and dark brown-loose-moist. (Fill:SM)		8
		2	SS			5
5				Fine sand, some gravel, little silt, trace cinders, organics and roots-dark brown-loose-moist. (Fill:SM)		
		3	SS			11
		4	SS	See "A".		6
10						
		5	SS	Gravelly fine to coarse sand, trace silt-gray-medium dense-saturated. (SW)		24
		6	SS	Fine sand, little gravel, trace coarse sand, medium sand and silt-gray-dense-saturated. (SP)		45
15						
16.5		7	SS	Drilled and sampled with no recovery.		

END OF BORING

"A" - Fine to coarse sand and cinder fill, little gravel, brick fragments and buried silty sand topsoil, trace organics and shells-light brown to black-loose to medium dense-moist to wet. (Fill:SP)

Boring advanced to 15' using hollow stem auger. Monitoring well installed. See enclosed Well Installation Diagram.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL 9.5' WD (WS OR WD)	BORING STARTED 4-21-87	STS OFFICE Lansing	
WL 8' BCR 8' ACR	BORING COMPLETED 4-21-87	DRAWN BY DTH	SHEET NO. 1 OF 1
WL	RIG CME-55 FOREMAN BP	APP'D BY WEH	STS JOB NO 1123XF

BL:1-0584

To: John Bonram

MEN01771

Subject: Chipyard Containment

From: Keith K

Week of Nov 10, 1987 Containment was built around #1 Truck Dumper cylinders, #2 Truck Dumper cylinders and #2 Truck Dump operating equipment

October 27, 1988 Concrete containment was improved at #1 Truck Dumper. Concrete sumps were installed at 3 locations at #2 Truck dumper. A concrete slab w/ curb was installed for oil barrel storage at #2 Truck Dumper.

February 1, 1989 An 8 inch well for containment of oil was installed at #2 Truck Dumper

March 17, 1989 A meeting was held with Peerless-Midwest and STS concerning the small water flow vs. the predicted flow. A change of scope was made and appropriate equipment was ordered.

May 11, 1989 The recovery well was put on line. Water is stored in a tanker and hauled to the aeration pond

MEN01772

MENASHA CORPORATION
PAPERBOARD GROUP

November 9, 1987

Orchard Hill Landfill
3378 Hennesey Road
Watervliet, MI. 49098

Dear Sir:

Please find enclosed an MSDS sheet for Mobil DTE 13 hydraulic oil. Due to a broken line, approximately 150 gallons of this material sprayed onto the ground and onto our wood chip pile. The material we are sending your landfill is a combination of wood chips, oil dry, soil and oil. This material is of a nonhazardous nature.

If you have any questions, please contact the writer or John Bonham.

Sincerely,

Otsego Paperboard Division

Keith B. Kling

Keith B. Kling
Waste Treatment Supervisor

Enclosure
cc: John Bonham

/ac

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

********************** I. PRODUCT IDENTIFICATION **********************

MOBIL DTE 13

SUPPLIER:
MOBIL OIL CORP.

HEALTH EMERGENCY TELEPHONE:
(212) 883-4411

CHEMICAL NAMES AND SYNONYMS:
PET. HYDROCARBONS AND ADDITIVES

TRANSPORT EMERGENCY TELEPHONE:
(800) 424-9300 (CHEMTREC)

USE OR DESCRIPTION:
HYDRAULIC OIL

************ II. TYPICAL CHEMICAL AND PHYSICAL PROPERTIES ************

APPEARANCE: AMBER LIQUID ODOR: MILD PH: NA
VISCOSITY AT 100 F, SUS: 150.0 AT 40 C, CS: 29.6
VISCOSITY AT 210 F, SUS: 46.5 AT 100 C, CS: 6.0
FLASH POINT F(C): >330(166) (ASTM D-92)
MELTING POINT F(C): NA POUR POINT F(C): -40(-40)
BOILING POINT F(C): > 600(316)
RELATIVE DENSITY, 15/4 C: 0.882 SOLUBILITY IN WATER: NEGLIGIBLE
VAPOR PRESSURE-MM HG 20C: < .1

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER INFORMATION, CONTACT YOUR LOCAL MARKETING OFFICE.

************************** III. INGREDIENTS **************************

	WT PCT (APPROX)	EXPOSURE LIMITS MG/M3	PPM	SOURCES (AND NOTES)
HAZARDOUS INGREDIENTS:				
NONE				
OTHER INGREDIENTS:				
REFINED MINERAL OILS	>90	-		
ADDITIVES AND/OR OTHER INGREDS.	<10			

KEY TO SOURCES: A=ACGIH-TLV, A*=SUGGESTED-TLV, M=MOBIL, O=OSHA
NOTE: LIMITS SHOWN FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS.

*********************** IV. HEALTH HAZARD DATA ***********************

EFFECTS OF OVEREXPOSURE: SLIGHT SKIN IRRITATION.

*************** V. EMERGENCY AND FIRST AID PROCEDURES ****************

EYE CONTACT: FLUSH WITH WATER.
SKIN CONTACT: WASH CONTACT AREAS WITH SOAP AND WATER.
INHALATION: NOT EXPECTED TO BE A PROBLEM.
INGESTION: NOT EXPECTED TO BE A PROBLEM. HOWEVER, IF GREATER THAN 1/2 LITER(PINT) INGESTED, IMMEDIATELY GIVE 1 TO 2 GLASSES OF WATER AND CALL A PHYSICIAN, HOSPITAL EMERGENCY ROOM OR POISON CONTROL CENTER FOR ASSISTANCE. DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

***************** VI. FIRE AND EXPLOSION HAZARD DATA *****************
FLASH POINT F(C): > 330(166) (ASTM D-92)
FLAMMABLE LIMITS. LEL: .6 UEL: 7.0
EXTINGUISHING MEDIA: CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.
SPECIAL FIRE FIGHTING PROCEDURES: FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS.
UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

************************ VII. REACTIVITY DATA ************************
STABILITY (THERMAL, LIGHT, ETC.): STABLE
CONDITIONS TO AVOID: EXTREME HEAT
INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZERS
HAZARDOUS DECOMPOSITION PRODUCTS: CARBON MONOXIDE.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

******************** VIII. SPILL OR LEAK PROCEDURE ********************
ENVIRONMENTAL IMPACT: REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL FREE NUMBER 800-424-8802.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.
WASTE MANAGEMENT: DISPOSE OF WASTE BY SUPERVISED INCINERATION IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

***************** IX. SPECIAL PROTECTION INFORMATION *****************
EYE PROTECTION: NO SPECIAL EQUIPMENT REQUIRED.
SKIN PROTECTION: NO SPECIAL EQUIPMENT REQUIRED. HOWEVER, GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.
RESPIRATORY PROTECTION: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.
VENTILATION: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

************************ X. SPECIAL PRECAUTIONS ************************
HANDLING: NO SPECIAL PRECAUTIONS REQUIRED.

************************ XI. TOXICOLOGICAL DATA ************************
---ACUTE---
ORAL TOXICITY (RATS): SLIGHTLY TOXIC(ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.
DERMAL TOXICITY (RABBITS): SLIGHTLY TOXIC(ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.
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********************** XII. REGULATORY INFORMATION **********************

TSCA INVENTORY STATUS: ALL COMPONENTS ARE REGISTERED.
EINECS INVENTORY STATUS: ALL COMPONENTS ARE REGISTERED.
THE FOLLOWING PRODUCT INGREDIENTS ARE CITED ON THE LISTS BELOW:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS

*** NO INGREDIENT CITATIONS ***

--- KEY TO LIST CITATIONS ---

1 = OSHA, 2 = ACGIH, 3 = IARC, 4 = NTP, 5 = NCI,
6 = EPA CARC, 7 = NFPA 49, 8 = NFPA 325M, 9 = DOT HMT, 10 = CA RTK,
11 = IL RTK, 12 = MA RTK, 13 = MN RTK, 14 = NJ RTK, 15 = NJ SHH,
16 = FL RTK, 17 = PA RTK.

****

FOR MOBIL USE ONLY: (FILL NO: MTL231A2A005) MHC: 1* 1* NA 0* 1* PPEC:
US84-373 APPROVE REVISED: 04/16/35 NEW PRODUCT MSDS

****

PREPARED BY: MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPARTMENT, PRINCETON, NJ
FOR FURTHER INFORMATION, CONTACT:
MOBIL OIL CORPORATION, PRODUCT FORMULATION AND QUALITY CONTROL
3225 GALLOWS ROAD, FAIRFAX, VA 22037 (703) 849-3265

****

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MENASHA CORPORATION
PAPERBOARD GROUP

Mr. Galen Kilmer
Michigan Dept. of Natural Resources
621 10th Street
Plainwell, MI. 49080

August 2, 1989

Dear Galen:

As Menasha has previously reported, the mill's #2 truck dumper periodically leaked enough hydraulic oil over a period of years to cause an oil plume to extend through the soil down to the first groundwater table. This letter is to update you on Menasha's most recent actions and plans regarding this problem. A full report will follow later.

In November 1987, several concrete containment structures were built at the #2 truck dumper to prevent any future oil leakage from entering the soil. This also had the effect of sealing the surface over part of the oil plume, which should have slowed its downward migration.

Additional subsurface exploration was commissioned by Menasha and performed in October, 1988. Three monitoring wells were installed, bringing to five the number of monitoring wells installed near the #2 truck dumper. The installation and subsequent chemical analysis of the monitoring wells indicated that groundwater in the region of the east truck dumper had not been significantly impacted by past hydraulic oil releases.

Based on recommendations from the consulting engineers, a low volume interceptor well was installed near the south edge of the oil contamination plume. This well has been fully operational since May, 1989. It is restricted to pumping only ½ gpm due to the very shallow aquifer above the clay lens, but has been shown to draw down the adjacent monitoring wells quite satisfactorily. This interceptor well serves to prevent any off-site migration of oil. To date, only trace amounts of oil have been pumped out, since very little oil has actually reached the groundwater.

It is Menasha's intent in September and October of this year to spend approximately $700,000 to replace the existing hydraulic screening system at the truck dumper with an electric system. This will eliminate the source of contamination from the screening system. As part of the demolition of the existing system, as much contaminated soil will be removed as possible without undermining nearby foundations.

Menasha is currently considering the merits of installing a purging irrigation system to drive water through the remaining contaminated soil to move the residual oil down to where it can be captured by the interceptor well. Although we are not yet certain that an irrigation system is merited, we intend to install the appropriate piping during the upcoming excavation and backfilling before the new screening system is installed. Prior to any actual use of the irrigation system, Menasha would obtain appropriate permits as required from the MDNR.

Please let me know by August 18 if these steps do not meet your expectations for remedial action. Barring any comments, we will proceed as detailed above.

Sincerely,

Otsego Paperboard Division

John T. Bonham
Engineering/Technical Services Manager

JTB:amc

MEN01778

MENASHA CORPORATION
PAPERBOARD GROUP

November 9, 1987

Orchard Hill Landfill
3378 Hennesey Road
Watervliet, MI. 49098

Dear Sir:

Please find enclosed an MSDS sheet for Mobil DTE 13 hydraulic oil. Due to a broken line, approximately 150 gallons of this material sprayed onto the ground and onto our wood chip pile. The material we are sending your landfill is a combination of wood chips, oil dry, soil and oil. This material is of a nonhazardous nature.

If you have any questions, please contact the writer or John Bonham.

Sincerely,

Otsego Paperboard Division

Keith B. Kling

Keith B. Kling
Waste Treatment Supervisor

Enclosure
cc: John Bonham

/ac

OTSEGO MILL BOX 155 • 320 N. FARMER STREET • OTSEGO MICHIGAN 49078 • PHONE 616 692 6141

Mobil

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

********************** I. PRODUCT IDENTIFICATION **********************

MOBIL DTE 13

SUPPLIER:
MOBIL OIL CORP.

HEALTH EMERGENCY TELEPHONE:
(212) 883-4411

CHEMICAL NAMES AND SYNONYMS:
PET. HYDROCARBONS AND ADDITIVES

TRANSPORT EMERGENCY TELEPHONE:
(800) 424-9300 (CHEMTREC)

USE OR DESCRIPTION:
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VISCOSITY AT 210 F, SUS: 46.5 AT 100 C, CS: 6.0
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OTHER INGREDIENTS:				
REFINED MINERAL OILS	>90			
ADDITIVES AND/OR OTHER INGREDS.	<10			

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************************ X. SPECIAL PRECAUTIONS ************************
HANDLING: NO SPECIAL PRECAUTIONS REQUIRED.

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11 = IL RTK, 12 = MA RTK, 13 = MN RTK, 14 = NJ RTK, 15 = NJ SHH,
16 = FL RTK, 17 = PA RTK.

****

FOR MOBIL USE ONLY: (FILL NO: MTL231A2A005) MHC: 1* 1* NA 0* 1* PPEC:
US84-373 APPROVE REVISED: 04/16/85 NEW PRODUCT MSD6

****

PREPARED BY: MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPARTMENT, PRINCETON, NJ
FOR FURTHER INFORMATION, CONTACT:
MOBIL OIL CORPORATION, PRODUCT FORMULATION AND QUALITY CONTROL
3225 GALLOWS ROAD, FAIRFAX, VA 22037 (703) 849-3265

****

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MEN01782

MENASHA CORPORATION
PAPERBOARD GROUP

November 13, 1987

Orchard Hill Landfill
3378 Hennesey Road
Watervliet, MI. 49098

Dear Sir:

We recently brought approximately 30 yards of wood chips, soil, and oil dry mixed with hydraulic oil to your landfill for disposal. This was material from beneath our #2 truck dumper. We are now in the process of cleaning beneath the #1 truck dumper and will have about 20-30 yards of similar material to dispose of. Pending your approval, we would like to bring this material on Tuesday, 11/17.

If you have any questions please contact the writer or John Bonham.

Sincerely,

Otsego Paperboard Division
Keith B. Kling
Keith B. Kling
Waste Treatment Supervisor

cc: J. Bonham
R. Thaxton

/ac

FORM 561

memo / CORPORATION MEN01783

TO: John Bonham

DATE: February 24, 1988

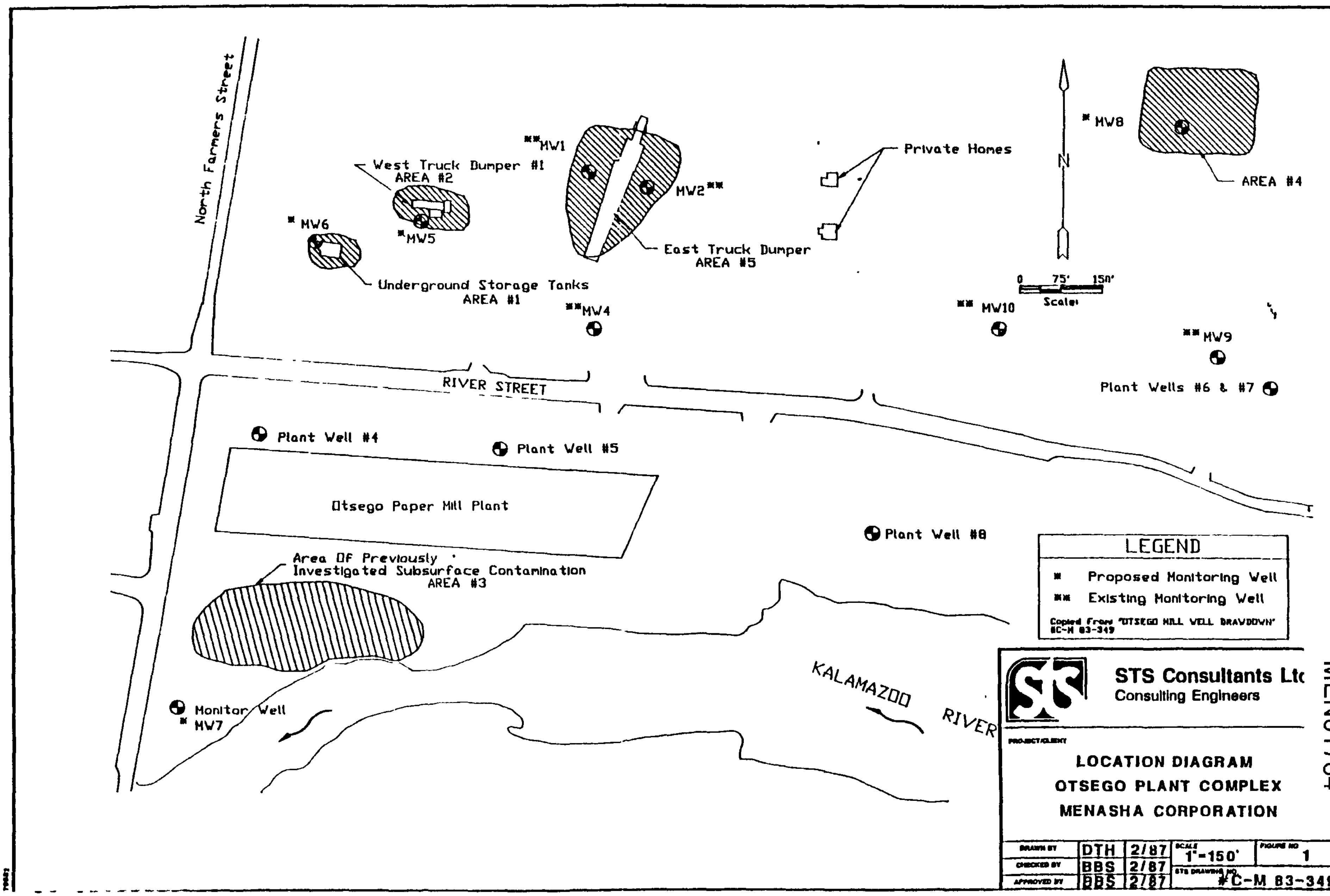
SUBJECT: Truck Dumper Monitoring Wells

FROM: Gary Roys GAR

The monitoring wells located in the chipyard at both truck dumpers were sampled on February 23, 1988. Neither #2 truck dumper east well (MW2@) nor the #1 truck dumper well (MW5@) contained any visible oil in the samples. The west well at #2 truck dumper (MW1@) contained about 1/2" of oil in the sample.

@ - These are well designation per STS Consultants drawing number C-M 83-349.

/ac


North Farmers Street
West Truck Dumper #1
AREA #2
MW1
MW2
MW4
MW5
MW6
MW8
MW9
MW10
Underground Storage Tanks
AREA #1
East Truck Dumper
AREA #5
Private Homes
AREA #4
N
0 75' 150'
Scale:
RIVER STREET
Plant Wells #6 & #7
Plant Well #4
Plant Well #5
Otsego Paper Mill Plant
Plant Well #8
Area Of Previously
Investigated Subsurface Contamination
AREA #3
Monitor Well
MW7
KALAMAZOO RIVER
LEGEND
Proposed Monitoring Well
Existing Monitoring Well
Copied From "OTSEGO MILL WELL DRAWDOWN" #C-M 83-349
STS Consultants Ltd
Consulting Engineers
LOCATION DIAGRAM
OTSEGO PLANT COMPLEX
MENASHA CORPORATION
DTH 2/87
BBS 2/87
BBS 2/87
1"=150'
1
#C-M 83-349

MEN01784

FORM 561

memo / [logo] CORPORATION MEN01785

TO: John Bonham

DATE: July 15, 1988

SUBJECT: #1 Truck Dumper

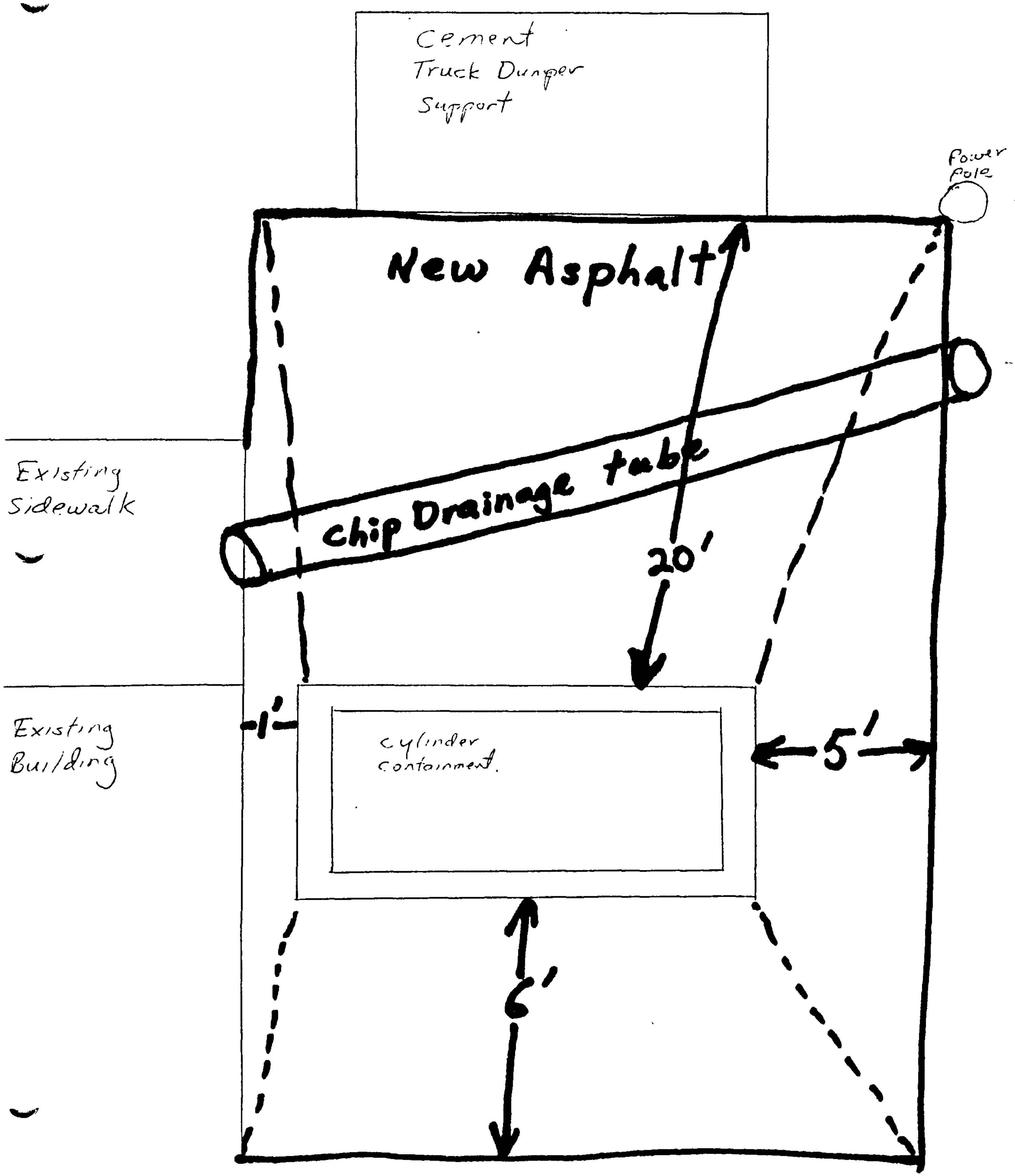
FROM: Keith Kling KBK

On 7/14, Ron Thaxton and I discussed the problems with containing oil spills from the #1 truck dumper. To do this job properly, soft dirt around the cylinder containment area must be excavated, a drainage tube for chip run off must be installed and stabilized gravel must be put down. The area must be asphalted. A diagram showing dimensions is attached.

cc: Ron Thaxton

/ac

MEN01786



Cement
Truck Dumper
Support
Power
Pole
New Asphalt
Chip Drainage tube
20'
Existing
Sidewalk
Existing
Building
1'
cylinder
containment.
5'
6'

FORM 561

memo / John

MEN01787

CORPORATION

TO: Distribution

DATE: July 20, 1988

SUBJECT: #2 Truck Dumper

FROM: Keith Kling KBK

For the past month I have been evaluating the #2 truck dumper for environmental concerns. I have talked with operators, Maintenance people, Brian Austin from Motion Industries and Mike denOtter. In order to lessen the lack of problems with that equipment, I feel the following step need to be taken.

1. The lower containment area is completely filled with chips, dust and oil. Mike stated this will be cleaned out before the upcoming 5 day maintenance down. The metal pans under the augers will be repaired or replaced as necessary. We also discussed the fact that some chips will always get into this area so routine cleaning will be required.

2. The containment area directly north of the augers, used to catch fuel leaking out of raised trucks, is completely full of chips. During the down, shields will be welded onto the truck dumper to prevent this. Mike and I discussed the fact that this containment area is quite deep and narrow. It may be necessary to put drain holes from this containment area to the lower containment area.

3. The piping to the cylinders is conduit with compression fittings. This is not adequate to hold the pressures which develop in the system. The pipe should be Schedule 80 black pipe. Hydraulic hose should be on each end to absorb shock and vibration. The other hard piped areas are also conduit, but are less susceptible to shock.

4. The hydraulic hoses going to the auger drive motors lay in the containment area beneath 4-16 inches of chips and dust. The drive motors should be turned over and hard piping (Schedule 80 black pipe) should be run to the motors from overhead.

5. The hoses from the manual controller lay all over in the containment area and are completely buried with chips and dust. The hoses could be consolidated into one area quite easily. These could be run through a metal or cement chute with an inspection cover on top. It would have to be tall enough to stick above the chips. This would provide protection for the hoses and would provide a way to see leaks before major oil losses occur.

6. The hydraulic motor on the upper end of the stacking conveyor has a very high spill potential. Its positioning high in the air also makes cleanups large and costly. An electric drive motor should be used in place of the hydraulic motor.

7. The containment area oil reservoir room cannot be emptied of spilled oil at this time. I am presently getting a cost on sumps for the containments and U-drain for the reservoir room to improve this situation.

In looking at repairs throughout the mill, cost comparisons are inevitably made. Mobil oil DTE26 costs $2.59 per gallon. Since April 11 we have used $1994.00 of this oil. Landfill costs are now $12.00 per yard, plus handling charges. This is up from $3.00 per yard in 1984. Expect this cost to double within a few years. These leaks also cause frequent downtime and excessive maintenance time. In the interest of the environment and from an economic standpoint, these changes should be made immediately.

cc: Mike denOtter
Ken Hartman
Lee Holmes
S.J. Rosenthal

/ac

MEN01789

MENASHA CORPORATION
PAPERBOARD GROUP

August 15, 1988

Dave Ganka
Ganka's Construction Company
10979 8 Mile Road
Battle Creek, MI. 49017

Dear Dave,

Several projects are presently under consideration involving containment with cement walls or berms. Listed below is a short description of each project.

1) **FUEL TANK CONTAINMENT**

   The attached drawing should provide necessary information.

2) **#1 TRUCK DUMPER**

   Install cement containment around the dumper cylinders as shown on the drawing. Install a 20 inch deep sump at one side with a double screen and metal top. Remove soft dirt and haul to landfill (landfill cost to be figured separate from this bid). Put in a drainage tube and backfill as shown on the drawing.

3) **#2 TRUCK DUMPER (CYLINDERS)**

   Install a 20 inch deep sump on one side of the cylinder containment with a double screen and metal top.

4) **#2 TRUCK DUMPER (LOWER CONTAINMENT)**

   Install a sump as described above.

5) **#2 TRUCK DUMPER (OIL RESERVOIR BUILDING)**

   Cut in 20 feet of U-drain. Slope to a 4 ft. X 4 ft. sump with a metal top. Install a cement slab for oil drums, sloped to the sump.

6) **SOIL BEHIND DIGESTER**

   The area behind the digester is a series of trenches and low spots between tanks, drives and buildings. This will need to be hand dug to solid material. Backfill and pour cement, sloping to nearest drain.

I would like to receive costs listed for each project, however all projects will be awarded to an individual contractor. If you are interested in bidding on these projects and would like more information, you can contact me at 692-6141.

Sincerely,

Otsego Paperboard Division

Keith B. Kling

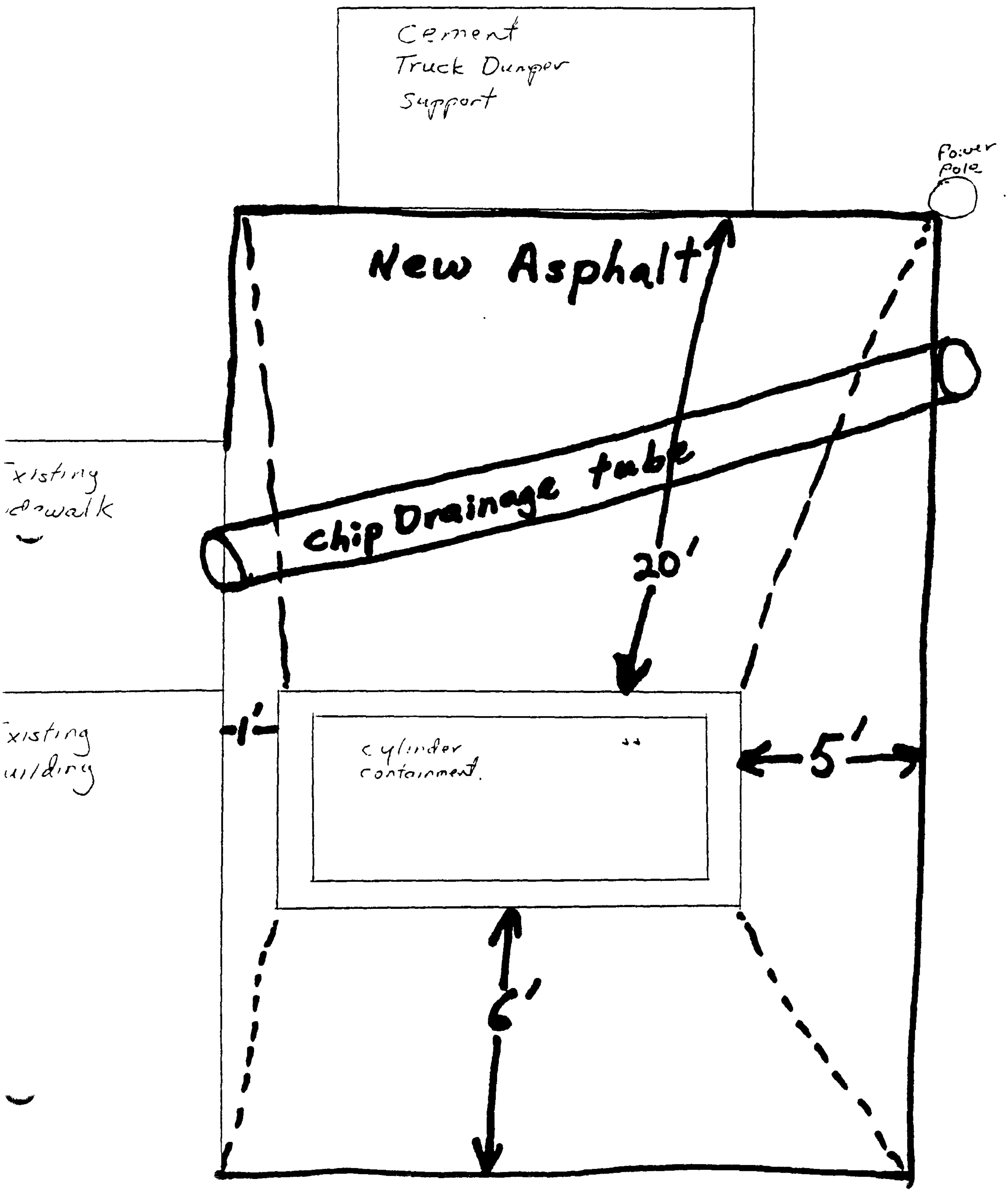
Keith B. Kling
Environmental Supervisor

cc: John Bonham

Enclosures
/ac

#1 Truck Dumper

MEN01791



FORM 561

MEN01792

memo / [logo] CORPORATION

TO: John Bonham

DATE: August 23, 1988

SUBJECT: #2 Truck Dumper

FROM: Gary E. Roys

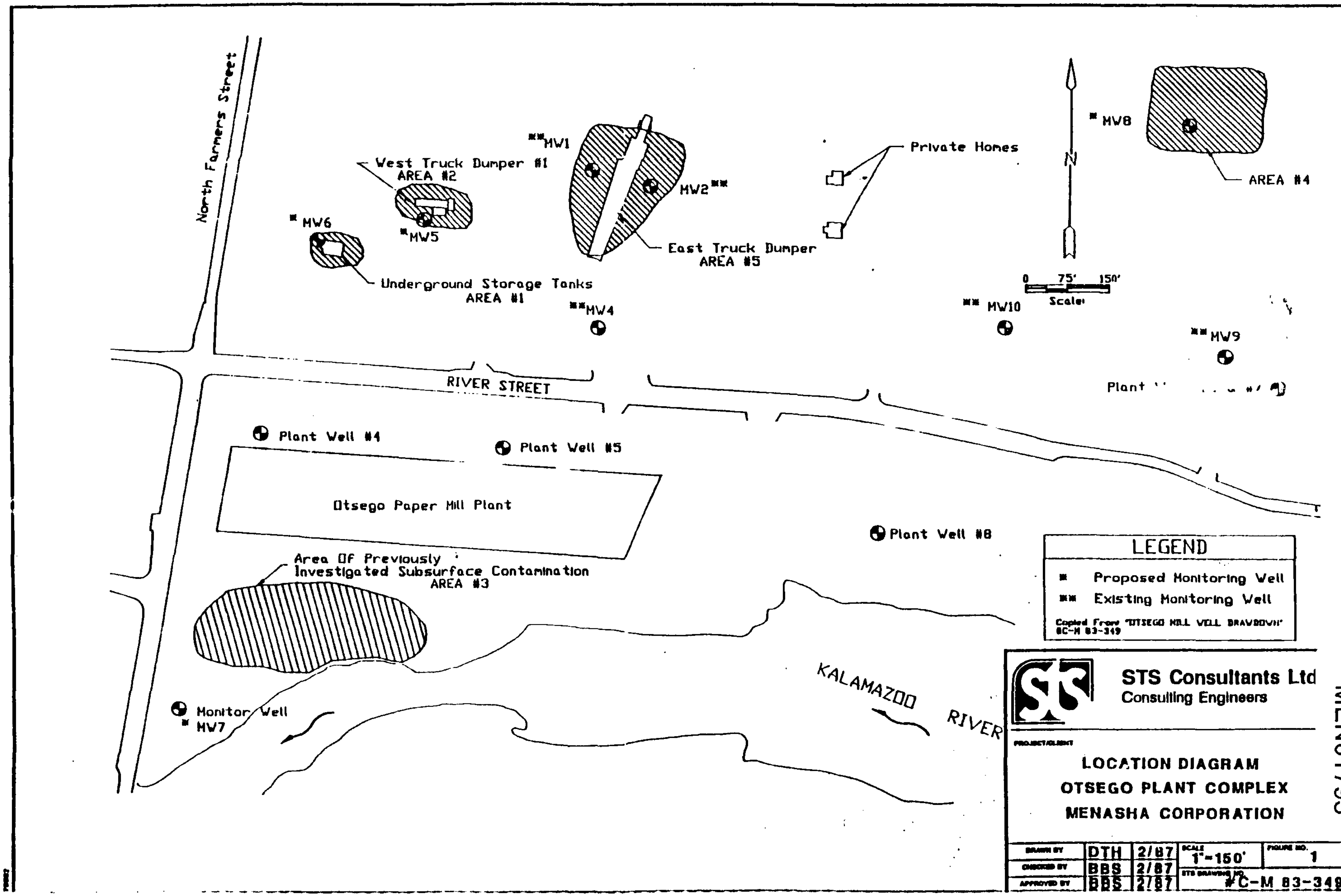
GER

On August 9, 1988, the East MW2@ and West MW1@ monitoring wells at the #2 truck dumper were sampled. At this time the east well's sample did not contain any traces of visible oil. The west well was found to have a considerable amount of oil. The baler was placed about 18-20" into the liquid and the entire sample removed was oil. The next bail produced water and oil. a 4-5 gallon amount was removed from the well and was sampled again on August 16, 1988. At this time, the bailer was dropped 14 inches into the liquid layer in the well. Again oil only was removed on the first bail. The well was bailed in this way two more times and again the sample contained only oil. The 4th produced water and some oil.

@ These are well designations per STS Consultants drawing number C-M 83-349.

cc: Keith Kling

/ac



North Farmers Street
West Truck Dumper #1
AREA #2
**MW1
MW2**
Private Homes
*MW8
AREA #4
N
*MW6
*MW5
East Truck Dumper
AREA #5
Underground Storage Tanks
AREA #1
**MW4
0 75' 150'
Scale:
** MW10
**MW9
RIVER STREET
Plant
Plant Well #4
Plant Well #5
Otsego Paper Mill Plant
Plant Well #8
Area Of Previously
Investigated Subsurface Contamination
AREA #3
Monitor Well
*MW7
KALAMAZOO RIVER
LEGEND
* Proposed Monitoring Well
** Existing Monitoring Well
Copied From "OTSEGO MILL WELL DRAWDOWN" 8C-M 83-349
STS Consultants Ltd
Consulting Engineers
PROJECT/CLIENT
LOCATION DIAGRAM
OTSEGO PLANT COMPLEX
MENASHA CORPORATION
DRAWN BY DTH 2/87
CHECKED BY BBS 2/87
APPROVED BY BBS 2/87
SCALE 1"=150'
FIGURE NO. 1
STS DRAWING NO. #C-M 83-349

MEN01793

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

September 1, 1988

Mr. John Blauwkamp
Menasha Corporation
1645 Bergstrom Road
P.O. Box 367
Neenah, WI 54957

RE: Otsego Paperboard Plant - Truck Dumper No. 2
ASSESSMENT OF CONTAMINATION ENCOUNTERED IN MONITORING WELL MW-1

Dear Mr. Blauwkamp:

As we have previously discussed, considerable amounts of contamination have recently been encountered in monitoring well MW-1 below Truck Dumper No. 2, at the Otsego Paperboard Plant. The contamination consists of hydraulic oil and presumably originated within the truck dumper equipment in the area. This area was the subject of a hydrogeologic study performed by STS in February of 1986.

As you know, previous to the contamination which was recently encountered, a sampling crew from STS encountered hydraulic oil in the well. However, it was believed that this contamination was caused by oil flowing down the well casing, since the well casing was damaged during chip moving operations in the area. The current contamination most likely originated from the continued spills of hydraulic oil in the area, which has moved through the soil column and finally reached the water table.

Once the hydraulic oil reaches the groundwater surface, it appears to be spreading in a free product layer. STS understands that no free product has been encountered in monitoring well MW-2; however, based on groundwater flow at the site, this well would be slightly upgradient or side-gradient to monitoring well MW-1. Therefore, the horizontal limits of the free product plume, as it exists, are not known.

Based on previous borings at the truck dumper, a sandy clay soil strata is known to underlie the upper sand soils at the truck dumper. In the locations of monitoring wells MW-1 and MW-2, this sandy clay layer was encountered approximately 5 feet below the groundwater table. Soil boring B-3, located approximately 60 feet south of monitoring well MW-1, encountered the sandy clay layer above the water table. Finally, monitoring well MW-4, located approximately 150 feet south of the truck dumper, did not encounter the sandy clay layer, although the boring was only extended 5 feet into the groundwater table. In general, it appears that the sandy clay layer is localized and fairly limited in extent, presenting only a limited aquifer above it. It is not expected that oil contamination would be traveling through the sandy clay layer, since the oil is a bouyant product and, in addition, the clay is of lower permeability. That is, the clay layer more than likely limits vertical extents of soil contamination.

Since a limited aquifer exists above the sandy clay, a large pumping well located above it would be of limited use, and quite probably would pump dry over a very short period of time. In addition, a large capacity well installed with intake below the clay layer would negate any vertical control which now exists on the contaminant, and more than likely make the problem larger by spreading the contamination vertically once the sandy clay layer was dewatered.

Finally, if the sandy clay layer is above the water table to the southwest of the truck dumper, then the larger groundwater control well would not be required, since the sandy clay would make a natural boundary to movement of the hydraulic oil. Therefore, a small well with its screen located directly above the clay would be sufficient to control the oil.

Based on the discussion provided above. additional investigation of the area needs to be performed. This investigation requires the performance of two tasks: 1) to more completely define the lateral migration of the oil. and 2) to define a real extent of the clay layer.

STS recommends the installation of a minimum of three (3) additional monitoring wells at the site. STS proposes the first well be located to the southwest of current monitoring well MW-1, at the top of the truck dumper depression. This well should be 30 to 40 feet deep, and be placed shallow on the clay layer, if it exists in this area. Two additional wells would be placed at the southwest edge of the wood chip pile, particularly looking for the clay layer and aquifer extent above the clay layer. STS recommends one well be extended through the clay and attempt to determine the thickness of the clay. If the hydraulic oil has moved considerably far from the area of the truck dumper, then additional wells would be required.

As requested, STS has estimated the capacity of production wells in the area of Truck Dumper No. 2. These capacities are based upon three different scenarios. These are as follows:

a. Scenario A - This scenario assumes that the clay layer does not exist above the water table to the southwest of the truck dumper (in the direction of ground-water flow); therefore, the hydraulic oil has moved from the top of the clay layer at monitoring well MW-1, and is moving in a general southwest direction. This scenario being the case, a well of fair capacity (100 gpm) would be required to extend a considerable zone of influence about the area of the truck dumper to control the flow of oil contamination (see drawing labeled Option 8).

b. Scenario B - This scenario involves the installation of a larger well (capacity approximately 100 gpm) in the close vicinity of the truck dumper. Specifically, if the oil contamination has not moved a considerable distance from the truck dumper, but a cone of depression around the truck dumper is required, then a well which perforates the upper clay and drains the oil to an intake pump in a solid section of well casing would be required. This well would also draw from below the clay unit to basically lower the water table around the clay and subsequently drain water and oil from the top.

c. Scenario C - This scenario involves the possibility that the clay layer extends above the groundwater table southwest of the truck dumper. In this case, only a small, semi-perched water table lying above the regional water table would exist. Therefore, a well of smaller capacity would be required only to pump from this more restricted area. This scenario involves a well of approximately 20 gpm capacity operated on a float system. This scenario was discussed in the August 1, 1988 report.

If you have any questions regarding this letter, please contact me. STS would be pleased to develop a proposal for additional evaluation of the hydrogeology of Truck Dumper No. 2, if Menasha so desires.

Respectfully,

STS CONSULTANTS, LTD.

Bernard B. Sheff, P.E.
Senior Project Engineer
Manager, Geo-Environmental Group

BBS/lch

BBS17 #35

cc: ✓Keith Kling, Otsego

MEN01798

PREIN & NEWHOF, P.C.
ENGINEERS — SURVEYORS
ENVIRONMENTAL & SOILS LABORATORIES
3000 EAST BELT LINE N E , GRAND RAPIDS MICHIGAN 49505
285 JAMES STREET, SUITE E. HOLLAND, MICHIGAN 49423

TELEPHONE (616) 364-8491
TELEPHONE (616) 399-9218
TELECOPIER (616) 364-6955

September 12, 1988
77129L

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

Re: Oil & Grease Results for MW 7

LABORATORY RESULTS

Lab Log #	Sample #	mL received	Oil & Grease, mg/L
2385	MW7-081788	780	<1.0
2549	MW7-082588	455	0.9
2689	MW7-090188	1,960	1.1

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Laboratory Director

MEN01799

PREIN & NEWHOF, P.C.
ENGINEERS — SURVEYORS
ENVIRONMENTAL & SOILS LABORATORIES
3000 EAST BELT LINE N.E., GRAND RAPIDS, MICHIGAN 49505
285 JAMES STREET, SUITE E, HOLLAND, MICHIGAN 49423

TELEPHONE (616) 364-8491
TELEPHONE (616) 399-9218
TELECOPIER (616) 364-6955

October 24, 1988
77129L

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

Re: Oil & Grease Results, Samples received 10/14/88

LABORATORY RESULTS

Lab Log #	Sample #	mL received	Oil & Grease, mg/L
3171	101388-North	330	<1.0
3172	101388-Southwest	340	<1.0

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Laboratory Director

FORM 705

9/82

MEN01800

CAPITAL/REPAIR EXPENDITURE AUTHORIZATION

EA- 48-159-8192

DIVISION	PLANT OR LOCATION		DATE
#48 Paperboard	Otsego, MI. 49078		11/18/88
PROJECT ADMINISTRATOR: J.T. Bonham	LIFE OF EQUIP.		EST. COMPL. DATE: 11/30/88

PROJECT DESCRIPTION & PURPOSE

Install containment structure at the chipyard to halt further fuel and oil contamination of the soil.

DESCRIPTION OF EXPENDITURE	EQUIP. & MATERIAL	LABOR: OUTSIDE	LABOR: COMPANY	TOTAL
Fuel tank containment structure with cement slab for fill area. Electricity to sump pump and diesel fuel tank.	7993			7993
At #1 truck dumper, extend cement to catch oil leaks. Install sump with screen. Install drainage tube for rain water.	2901			2901
At #2 truck dumper, install sump with screen on upper containment area.	568			568
At #2 truck dumper oil reservior uilding, cut 20ft. of U-drain in floor. Slope to sump. Install a cement slab, sloped to sump for storage of oil drums.	2644			2644
				14,106

APPROVED CAPITAL BUDGET AMOUNT $ 150,000

IF SINGLE BUDGET ITEM COVERING MULTIPLE ITEMS, INDICATE BUDGET AMOUNT REMAINING AFTER THIS REQUEST $ 38,801

(IF EA EXCEEDS CAPITAL BUDGET BY 5% OR MORE, EXPLAIN

ECONOMIC EVALUATION

INVESTMENT		CASH PAY-BACK	
FIXED ASSETS	14,106	PROFIT ON ADDED SALES	
PROJECT EXPENSE		COST REDUCTION OR AVOIDANCE	
WORKING CAPITAL		LESS: DEPR. ON NEW EQUIPMENT	
		PRE-TAX SAVINGS	
		50% OF PRE-TAX SAVINGS	
TOTAL INVESTMENT	14,106	ADD BACK DEPRECIATION	
		CASH PAY-BACK	

BOOK VALUE DISPL. ASSETS (MEMO ONLY) NONE

PAY-BACK	YRS.	MONTHS

PREPARED BY: Keith Kling Keith B. Kling

USE REVERSE SIDE OF SHEET FOR SUPPORTING DETAILS ON SAVINGS.

PREPARE ORIGINAL COPY ONLY. ORIGINAL WILL BE FORWARDED TO CONTROLLER AFTER APPROVAL AND WILL BE DISTRIBUTED BY CONTROLLER'S DEPARTMENT PER STANDARD PROCEDURE #1015. IF E. A. IS DISAPPROVED, THE ORIGINAL COPY WILL BE RETURNED IN SAME ROUTING USED IN PREPARATION, BUT IN REVERSE ORDER.

APPROVALS	DATE
~~PLANT MGR./PLANT ENGINEER~~ Eng.Supt - Eng/Tech Mgr. TR	11/18/88
DIVISION ACCOUNTANT Glen L Howard	
DIVISION MANAGER	
VICE PRESIDENT	
PRESIDENT	

NATURE OF EXISTING FACILITIES.

The existing fuel tanks set on the ground with no containment. The #1 truck dumper has a small containment around the hydraulic cylinders. The #2 truck dumper has three containment areas which generally capture oil spills.

WHERE INADEQUATE

The fuel tanks are required to have containment in case of spills. Also the fueling area is subject to spilling as evidenced by the existing soil contamination.

The containment around #1 truck dumper has been too small to capture most of the oil spills, Also it is extremely difficult to clean out due to wood chips and debris which gets into the containment area.

The containment around #2 truck dumper is extremely difficult to empty due to wood chips and debris. Also, the oil reservoir building does not adequately contain the oil and cleanup is very labor intensive.

PROPOSED REMEDY

Build a containment and have the fuel tanks relocated inside it. Have all vehicles fuel up on a cement slab which is sloped to the structure.

Extend the cement at #1 truck dumper to capture oil spills. Install a sump with screens to allow for easy cleaning of the structure.

Install sump with screens on #2 truck dumper to allow easy cleaning of the containment areas.

Install U-drains and a sump in the oil reservoir building to allow for recapture of lost oil.

MEN01802

CAPITAL/REPAIR EXPENDITURE AUTHORIZATION

FORM 705

DIVISION #48 PAPERBOARD	PLANT OR LOCATION OTSEGO, MI	EA-48-159-8552 DATE 12-12-88
PROJECT ADMINISTRATOR R. V. GULBRANSON	LIFE OF EQUIP.	EST. COMPL. DATE

PROJECT DESCRIPTION & PURPOSE

INSTALL GROUNDWATER RECOVERY WELL AT #2 TRUCK DUMPER AREA - ENVIRONMENTAL

DESCRIPTION OF EXPENDITURE	EQUIP. & MATERIAL	LABOR OUTSIDE	LABOR COMPANY	TOTAL
8" Diameter Well Casing 48' Gravel Packed and Pump Test	5,000	7,000		12,000
Pumps, Piping & Controls	7,700	5,500		13,200
Electrical	2,000	3,500		5,500
Contingency	1,500	1,600	--	3,100
Total	16,200	17,600		33,800

APPROVED CAPITAL BUDGET AMOUNT $ 87,000
IF SINGLE BUDGET ITEM COVERING MULTIPLE ITEMS, INDICATE BUDGET AMOUNT REMAINING AFTER THIS REQUEST $
(IF EA EXCEEDS CAPITAL BUDGET BY 5% OR MORE, EXPLAIN

ECONOMIC EVALUATION

INVESTMENT	
FIXED ASSETS	33,800
PROJECT EXPENSE	
WORKING CAPITAL	
TOTAL INVESTMENT	33,800

CASH PAYBACK	
PROFIT ON ADDED SALES	
COST REDUCTION OR AVOIDANCE	
LESS: DEPR. ON NEW EQUIPMENT	
PRE-TAX SAVINGS	
60% OF PRE-TAX SAVINGS	
ADD BACK DEPRECIATION	
CASH PAY-BACK	

BOOK VALUE DISPL. ASSETS (MEMO ONLY) NONE

PAY-BACK	YRS.	MONTHS

PREPARED BY: Ron Thaxton RT 12/12/88

APPROVALS	DATE
~~PLANT MGR. PLANT ENGINEER~~ Eng. Supt. Tech. Enc. Mgr. [signature]	12-12-88
DIVISION ACCOUNTANT [signature]	12-13-88
DIVISION MANAGER [signature]	12/13/88
VICE PRESIDENT	
PRESIDENT	

USE REVERSE SIDE OF SHEET FOR SUPPORTING DETAILS ON SAVINGS. PREPARE ORIGINAL COPY ONLY. ORIGINAL WILL BE FORWARDED TO CONTROLLER AFTER APPROVAL AND WILL BE DISTRIBUTED BY CONTROLLER'S DEPT. PER STANDARD PROCEDURE #1015. IF E.A. IS DISAPPROVED, THE ORIGINAL COPY WILL BE RETURNED IN SAME ROUTING USED IN PREPARATION, BUT IN REVERSE ORDER.

MEN01803

FORECAST & DETAIL SHEET

EA 48-159-8552:Groundwater Recovery Well, #2 T.D.

MONTHS TO START PROJECT.....1........	MONTHS TO COMPLETION OF PROJECT...3....
ADDITIONAL WORKING CAPITAL SPARE PARTS	$.....0.......
PERCENTAGE OF TOTAL CAPITAL COST ON FIRM PRICES	80 %
ORIGINAL VALUE OF ASSETS TO BE DISPOSED............	YEARS OF SERVICE........

TIMING OF PROPOSED EXPENDITURES (FOLLOWING DATE OF FINAL APPROVAL)

ITEMS	THREE MONTH PERIODS				FOLLOWING 12 MONTHS	SUBSEQUENTLY
	First	Second	Third	Fourth		
CAPITAL	33,800					
EXPENSE						
WORKING CAPITAL						
TOTAL	33,800					

TIMING OF INCOME (FIRST FIVE YEARS FOLLOWING DATE OF FINAL APPROVAL)

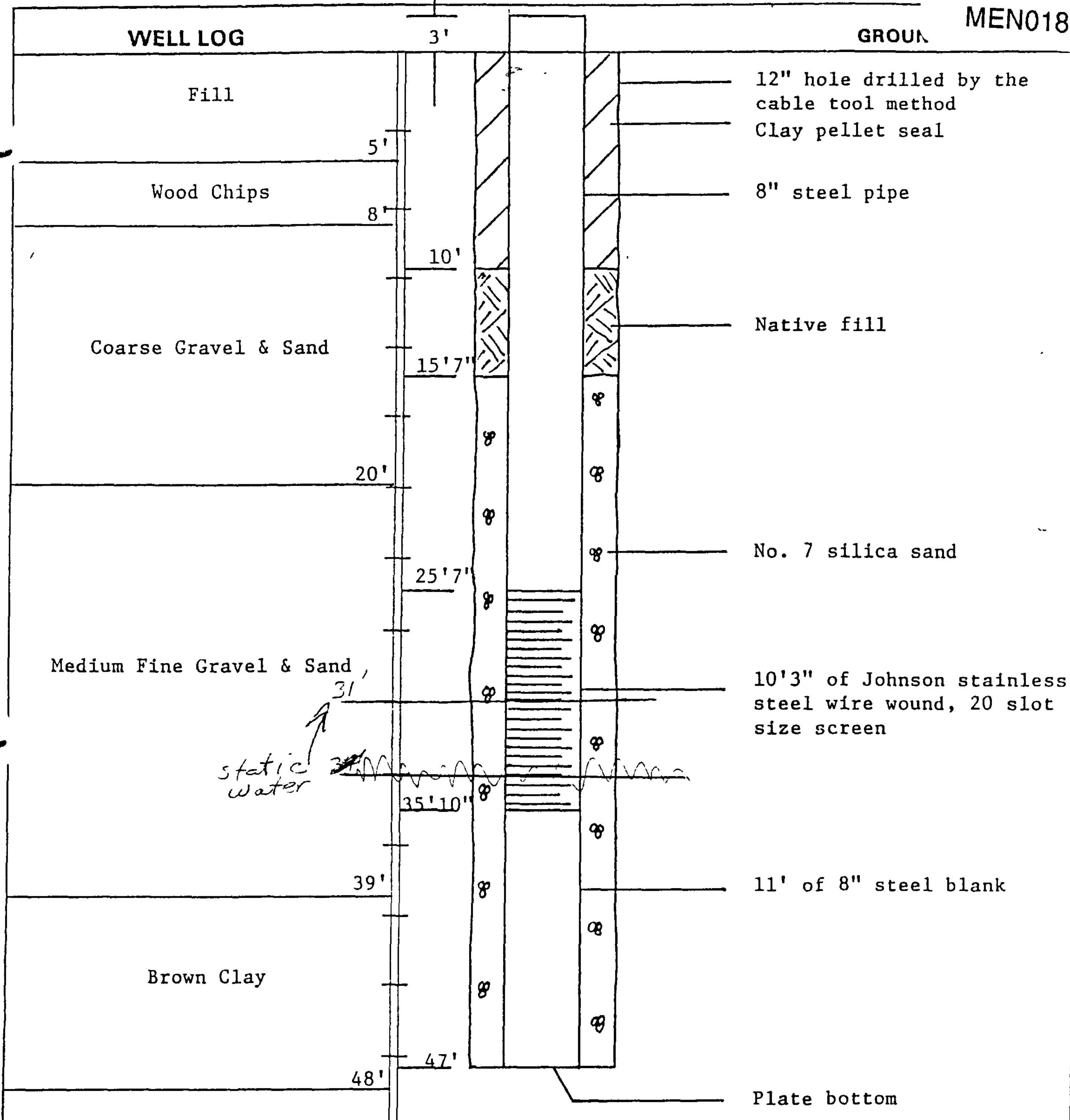
SOURCES	SIX MONTH PERIOD		TWELVE MONTH PERIOD			
	First	Second	Second	Third	Fourth	Fifth
SAVINGS						
ADDED SALES						
(DEPRECIATION)						
CHANGE IN OPERATING PROFIT						

EA 48-159-8552: Groundwater Recovery Well, #2 T.D.

Description	Asset Life for Deprec.	Capital		Total
		Equipment & Material	Labor	
1.1.1 Install 8" Steel Well Casing 48' Gravel Packed & Pump Test		5,000	7,000	12,000
1.2.1 Piping From Pump at Chip Yard to Mill. Insulate and Heat Trace		7,700	5,500	13,200
1.6.1 Electrical		2,000	3,500	5,500
1.7.1 Contingnecy		1,500	1,600	3,100
Total		16,200	17,600	33,800

MEN01805

WELL LOG



City Otsego State Michigan

Location 25' West of #2 Truck Unloader

County Allegan Twp. Otsego; T1N, $12W Section SW¼SE¼SW¼ of 14

Test Capacity 1 GPM. Static Water Level 34 ft. Pumping Level 41 ft.
Specific Capacity .14 GPM/Ft. D.D.
Date Drilled 2/1/89
Driller J. Blatz
Job No. 7610

Well No. 9

MENASHA CORPORATION
OTSEGO, MICHIGAN

PEERLESS-MIDWEST, INC.
Granger, Indiana

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

February 20, 1989

Mr. Keith Kling
Menasha Corporation
Otsego Paperboard Plant
320 North Farmer Street
Otsego, Michigan 49078

RE: Hydraulic Oil Recovery Well, East Truck Dumper - Pump Selection
STS Project No. 1183XF

Dear Mr. Kling:

This letter is in regard to our recent telephone conversation concerning the hydraulic oil recovery well at your Otsego plant. The purpose of this letter is to provide you with a brief summary of pump selections for the recovery well.

As you know, Peerless-Midwest recently drilled and installed an eight inch diameter well to a depth of approximately 47 feet from present grade. The well design consisted of an 11 foot sump below 10 foot, #20 slot stainless steel screen. The well screen was packed with #7 quartz sand. On February 1, 1989, a four hour pump test was performed to estimate probable flow rates and determine the volume of oil recovery. The pumping test consisted of monitoring the pumping rate and groundwater levels in the recovery well and nearby monitoring wells. The recovery well was also monitored for the presence of free product oil.

During the pump test, pumping rates of less than 0.5 gallons per minute (gpm) sustained approximately 5.0 feet of drawdown within the well. When the pumping rate was greater than one (1) gpm, the water level dropped below the bottom of the well screen. The water in the monitoring well MW-103 dropped approximately .05 feet during the test, although the other monitoring wells did not fluctuate during the test. Additionally, a free product layer was not observed in the pumping well during the pumping procedures.

The rate of pumping encountered during the short time period pump test were lower than had been estimated earlier, however, the drawdown observed in MW-103 suggests that even this low rate will apparently produce a radius of influence sufficient to limit flow downgradient of the recovery well. The lower flow rate may increase as pumping is continued in the well and the well continues to develop.

The low pumping rate, however, alters the selection of the groundwater depression pump. Originally, a submersible pump was suggested for use as a groundwater depression pump, as the collected water was to be discharged in the plant's whitewater system. Unfortunately, most submersible pumps cannot pump at rates lower than one (1) gpm without overheating and damaging the pump's motor.

A pneumatic pump which uses compressed air to pump the well water is a feasible alternative to a submersible pump at the low pumping rates, as they provide the correct pumping rate with overheating. The major drawback of these pumps is their inability to pump the water great distances without affecting the pumping rate. The problem of insufficient head could be corrected either by the use of an additional small certrifugal pump to move the water to the whitewater system, or as the flow rate is currently low, the use of a temporary storage tank to collect the water.

As a layer of free product has yet to be observed in the recovery well, it would be sufficient at this time, to use a single pneumatic well for the groundwater depression well. It could be equipped with a floating layer inlet so that any free product that did enter the well would be removed. If the water was pumped to the storage tank, the development of a large quantity of free product would be noted and skimming could be performed.

If the required pumping rate or free product layer increases, a dual-pump system may be installed, again utilizing either a pneumatic or submersible pump, depending upon applicability, while the existing pneumatic pump would still be used as a product recovery pump. In general, the system described above allows Menasha to remain flexible if conditions at the site change considerably with pumping.

The pneumatic pump suggested by STS is manufactured by QED Environmental Systems, Inc., and is described in Table 1, below.

Table 1
Pneumatic Pump and System

Model No.	Description
LP1001	4" PVC pulse pump
C1001	4" PVC free product inlet can
L360	Controller module to control air flow
L370	On/off level control module to prevent dewatering
L215C	Roving well cap (8", to hold pump in well)
L353	External Exhaust Valve
35419	20 ft. controller to cap hose
1417	UV protected nylon tubing, $\frac{1}{2}$" x $\frac{3}{8}$" air line
34944	UV protected nylon tubing, $\frac{1}{4}$" discharge line

Finally, an air compressor providing between 60 and 125 psi, and a 10 micron air intake filtration system is required to complete the pumping system. If Menasha does not have this equipment on-site, it is available at several industrial supply companies in Kalamazoo.

If you have any questions concerning the information in this letter, please do not hesitate to call us at (517) 321-4964.

Sincerely,

STS CONSULTANTS, LTD.

Anne M. Murray

Anne M. Murray
Environmental Geologist

Bernard B. Sheff, P.E.
Senior Project Engineer
Area Office Manager

AMM/lch

June 23. 1989

Mr. Keith Kling
Menasha Corporation
Otsego Paperboard Division
320 North Farmer Street
Otsego, Michigan 49078

RE: Addendum to Otsego Paperboard Plant Final Report
Results of Additional Hydraulic Oil Contamination Survey
STS Project No. 1123XF

Dear Mr. Kling:

Enclosed is the result of our subsurface exploration at the Otsego Paperboard Plant in Otsego. Michigan. performed in October. 1988. This report was completed under agreement by Menasha Corporation Purchase Order No. 4818499, dated August 2, 1987.

In general. this project was completed as an addendum to the Site Contamination Survey and Remediation Final Report dated August 1. 1988. Specifically. the project was performed to assess the extent of a hydraulic oil release at the east truck dumper at the Otsego. Michigan plant. and to develop recommendations for remedial measures.

Due to the quantity of additional information provided by this study. this report could not be incorporated into the body of the Final Report. Therefore. this report may be incorporated into Appendix G of the Final Report. The enclosed table of contents shall serve to update and ammend the existing table of contents of the Final Report. All additional enclosures may be placed within appropriate appendices. It should be noted that all references to appendices within the addendum will be in reference to those found within the Final Report.

1.0 Introduction

STS Consultants, Ltd. (STS) completed subsurface exploration program performed at the Otsego Paperboard Plant to assess the extent of hydraulic oil contamination in the area of the east truck dumper in June of 1986.

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
517.321.4964/Fax 517.321.2132

Recent increases in free product thicknesses in monitoring well MW-1 prompted the Menasha Corporation to review the site conditions at the east truck dumper and perform additional subsurface exploration. The additional subsurface exploration program included the drilling and installation of three (3) monitoring wells, elevation survey, and chemical analysis of soil and ground-water samples in order to estimate the impact of the hydraulic oil release downgradient and sidegradient of the truck dumper.

2.0 Field Exploration

The subsurface exploration program consisted of three soil borings utilizing a truck-mounted B-61 drill rig. These borings ranged in depth from 36.5 to 50 feet, and were performed using hollow stem augers.

During the drilling process, representative soil samples were collected using a split-barrel sampler in general accordance with ASTM Specification D-1586. Samples were collected and placed in clean, air-tight sample jars for further examination. Field logs of soils encountered in the boring were maintained by the drill crew. A typed version of these logs is included in Appendix B of the Final Report.

Clean protocol procedures were used during the drilling process to minimize cross-contamination. The cleaning procedures included the following steps:

a. Steam clean the back of the rig, sampling tools, casing, and screens prior to entering the site and between each boring.

b. Clean split-barrel soil sampler with tri-sodium phosphate and water between sampling.

c. Place soil samples in new, clean sample jars.

After drilling and preliminary soil classifications were completed, two inch diameter PVC monitoring wells with five foot of .01 inch slotted screens were installed in each soil boring. A natural sand pack was allowed to develop around the screen and bentonite seal was placed above the sand pack to minimize vertical migration of surface contamination. The wells were grouted to the surface with bentonite/cement slurry and fitted with flush-mounted sealed protector pipes. The well were developed by bailing utilizing a 5 foot PVC bailer.

Each well screen was set to intersect the groundwater to indicate the presence of hydraulic oil. Due to the presence of a sandy clay, the screen in MW-101 was set below the sandy clay, in order to assess vertical flow gradients across the sandy clay, if present. Monitoring well installation diagrams for each well are also enclosed in Appendix B of the Final Report.

Upon completion of the well installation, a survey was performed to estimate the elevation of the ground surface and well casing. Additionally, the location of these wells were added to the base map designated as Drawing 1, and enclosed in Appendix F of the Final Report. A summary of the well installation is presented below in Table 1.

TABLE 1
Summary of Well Installations

Well Designation	*Elevation (feet) Top of PVC Pipe	Ground Surface	Top of Screen	Bottom of Screen
MW-101	729.77	730.0	690.5	685.5
MW-102	728.13	728.5	693.1	688.0
MW-103	729.99	730.2	699.9	694.9

* Elevations referenced to a benchmark described as chisled X on floor of switch room 24.

3.0 Chemical Laboratory Analysis

An analytical testing program for both groundwater and soil samples was undertaken for this project.

One soil sample from each of the three soil borings was returned to Fire and Environmental Control Laboratories (FECL) in East Lansing, Michigan. The soil samples were selected from each boring to represent the upper surface of the groundwater. The results of the oil and grease analysis of the soil samples is presented in Table 2. A complete laboratory report is enclosed in Appendix C of the Final Report. Low levels of oil and grease was detected within each soil sample.

TABLE 2
Analytical Results

Soil Sample	Depth (ft.)	Oil & Grease (mg/kg)
MW-101 S-9	37.5-39.0	45.8
MW-102 S-8	35.0-36.5	42.4
MW-103 S-8	32.5-34.0	44.4

Menasha personnel collected groundwater samples from each of the three wells for oil and grease analysis. The results of these analyses were less than one part per million (ppm) of oil and grease for each well.

4.0 Hydrogeologic Analysis

On October 12, 1988, static water levels were measured in the three recently installed wells, MW 101, 102 and 103. The groundwater elevation summary is presented in Table 3.

TABLE 3
Summary of Groundwater Elevations of October 12, 1988

Well Designation	Depth to Water (ft)	Elevation* (ft)	
		Casing Top	Groundwater
MW-101	34.82	729.77	694.95
MW-102	31.75	728.13	696.38
MW-103	34.67	729.99	695.32

* Elevation referenced to benchmark described as a chisled X on floor of switch room 24.

The results of the three borings at the site indicate that downgradient of MW-1 the sandy clay unit appears to shallow to above groundwater surface, as indicated in the original study performed at the east truck dumper. Although, the groundwater elevation beneath the clay layer does not greatly differ from the groundwater elevation above the clay suggesting the clay layer may not provide a confining layer. Additionally, from the results of the chemical analysis, it appears that hydraulic oil has been transported into the clay layer at some time. However, as oil and grease were not detected in the groundwater samples, and free product was not observed in the new wells, this indicates that the recent increase of free product in MW-1 has not significantly impacted groundwater downgradient or sidegradient of the source at this time.

5.0 Summary, Conclusions, and Recommendations

The installation and subsequent chemical analysis of the monitoring wells, indicate that, presently, groundwater in region of the east truck dumper has not been significantly impacted by past and recent hydraulic oil releases. Additionally, the subsurface exploration indicated a sandy clay just below the groundwater at MW-1 appears to shallow downgradient. The presence and extent of this clay layer would reduce the ability of a large downgradient recovery well to remove free product from the groundwater.

Due to this clay layer, STS recommends the installation of a smaller recovery well near the source the contamination to remove free product from the surface of the groundwater in addition to contaminated groundwater. However, it appears a large amount of oil exists as residual within the unsaturated soil zone. In order to remove this oil, STS recommends the installation of a purging irrigation system. This system would drive water through the contaminated soil, taking with it some of the residual oils. Often to aid the purging process, surfactants are added to the water to facilitate the oil movement through the unsaturated zone. The additional water would be removed using all groundwater recovery well and pumped to an auto-skimming system. The merits of the irrigation system could be evaluated after all planned structural changes are made in the vicinity of the truck dumper.

We appreciate the opportunity to continue the study with you. If you have any questions or comments, please do not hesitate to contact us at (800) 444-4261.

Sincerely,

STS CONSULTANTS, LTD.

Anne M. Murray

Anne M. Murray
Environmental Geologist

Bernard B. Sheff, P.E.
Senior Project Engineer
Area Manager

AMM/lch AMM3 #30

Enclosure

MEN01814

TABLE OF CONTENTS

Appendix

MEN0181

Incorporate In Appendix A of Final Report

Sheet 1 of ____

TECHNICIAN AMM
DRILLER MB
HELPER BP
RIG NO. B-61

SURFACE ELEV. 730.0
BORING STARTED 9-26-88
BORING COMPLETED 9-27-88
STATION
OFF SET

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

CASING USED ____ SIZE ____

WATER LEVEL OBSERVATIONS
WL: 37.5 WS OR WD
WL: 38 BCR ____ ACR
WL: ____ AB ____ Hr. AB
WL: ____ 24 Hr. AB

OB NO. 1123XF **BORING NO.** MW-101 **CLIENT** Menasha Corp.-Otsego **WEATHER** sunny

Sample No.	Depth or Elevation From	To	Sampling Method	Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
	0	1.5	SS	6	12	12		0.6			Dark brown fine sand, trace medium coarse sand, gravel and wood chips.
	0	5.0	HS								
	5.0	6.5	SS	6	5	7		1.5		6.5	Dark brown fine sand, trace fine to coarse sand and gravel. Light brown at tip.
	5.0	10.0	HS								
	10	11.5	SS	8	42	12		0.7			Light brown fine to medium sand, trace coarse sand, gravel and cobbles.
	10	15	HS								
	15	16.5	SS	19	25	31		0.1			Cobble in tip.
	15	20	HS								
	20	21.5	SS	25	23	27		0.5			Light brown fine sand, trace medium sand.
	20	25	HS								
	25	26.5	SS	6	6	8		0.5			Same
	25	30	HS							30	
	30	31.5	SS	4	6	8		1.3			Brown fine sandy clay, trace gravel and silt wet.
	30	32.5	HS								
	32.5	34	SS	23	24	57		1.3			Brown fine sand, trace medium sand-moist. No water in augers.
	32.5	37.5	HS							36	
	37.5	39	SS	6	19	40		1.2			Brown sandy clay-wet.
	37.5	40	HS								
	40	41	SS	5	10	12		1.2			Brownish gray sandy clay-wet.
	40	45	HS								
	45	46	SS	12	40			1.0			Brown fine to medium sand, trace gravel, gray silt
	46	46.5	SS					.5			

(2 Feet spans the four 6" blow columns)

ABBREVIATIONS
F.T.-Fish Tail
W.O.-Wash Out
S.T.-Shelby Tube
S.S.-Split Spoon
D.B.-Diamond Bit
P.A.-Power Auger
R.B.-Rock Bit
W.S.-While Sampling
W.D.-While Drilling
B.C.R.-Before Casing Removal
A.C.R.-After Casing Removal
A.B.-After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ____
Fill Thickness ____

CAVE IN LEVEL:
While Drilling and Sampling ____
After Boring Completion ____

WATER LOSS:
At ____ To ____
Percent Loss ____
At ____ To ____
Percent Loss ____

BOULDERS OR OBSTRUCTIONS:
At ____ To ____
At ____ To ____

ARTESIAN PRESSURE:
Depth ____
Height of Soil Rise In Casing ____
Piezometer PVC or SS
Diameter ____ in.
Screen Depth ___ ft to ___ ft
Riser Pipe ___ ft to ___ ft

MEN01816

TECHNICIAN AMM
DRILLER MB
HELPER BP
RIG NO. B-61

SURFACE ELEV. 730.0'
BORING STARTED 9-26-88
BORING COMPLETED 9-27-88
STATION
OFF SET

STS Consultants Ltd
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

CASING USED ____ SIZE ____

WATER LEVEL OBSERVATIONS
WL: ____ WS OR WD
WL: ____ BCR ____ ACR
WL: ____ AB ____ Hr. AB
WL: ____ 24 Hr. AB

JOB NO. 1123XF BORING NO. MW-101 CLIENT Menasha Corp. Otsego WEATHER sunny

Depth or Elevation From	Depth or Elevation To	Sampling Method	Penetration Record – Split Spoon Blows 6"	6"	6"	6"	R – Length Recovered in Feet	Qp – Penetrometer Test in TSF	Strata Change	Sample Description
45	50	HS								No sample, trace 4' soil rise.
										EOB
										Monitoring well installed.
										See well installation diagram.

(Split spoon blows: ← 2 Feet →)

ABBREVIATIONS
- F T - Fish Tail
- W O - Wash Out
- S T - Shelby Tube
- S S - Split Spoon
- D B - Diamond Bit
- P A - Power Auger
- R B - Rock Bit
- W S - While Sampling
- W D - While Drilling
- B C R - Before Casing Removal
- A C R - After Casing Removal
- A B - After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ____
Fill Thickness ____

CAVE IN LEVEL:
While Drilling and Sampling ____
After Boring Completion ____

WATER LOSS
At ____ To ____
Percent Loss ____
At ____ To ____
Percent Loss ____

BOULDERS OR OBSTRUCTIONS:
At ____ To ____
At ____ To ____

ARTESIAN PRESSURE:
Depth ____
Height of Soil Rise In Casing ____
Piezometer PVC or SS
Diameter ____ in.
Screen Depth ____ ft to ____ ft
Riser Pipe ____ ft to ____ ft

MEN01817

Sheet 1 of ___

TECHNICIAN AMM
DRILLER MB
HELPER BP
RIG NO. B-61

SURFACE ELEV. 728.5'
BORING STARTED 9-27-88
BORING COMPLETED 9-27-88
STATION
OFF SET

STS Consultants Ltd
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

CASING USED HS SIZE

WATER LEVEL OBSERVATIONS
WL: 33.5 WS OR WD
WL: 37.5 BCR ACR
WL: AB Hr. AB
WL: 24 Hr. AB

JOB NO. 1123XF BORING NO. MW-102 CLIENT Menasha Corp.-Otsego WEATHER

Sample No.	Depth or Elevation From	To	Sampling Method	Penetration Record Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
	0	1.5	SS	1	6	12		.6			Brown sand, gravel and wood chips.
	0	5.0	HS								
	5.0	6.5	SS	24	17	14		0.0			Obstruction-cobbles.
	5.0	10.0	HS				(Auger Sample)				
	10.0	11.5	SS	9	13	13		0.0			Same
	10.0	15.0	HS				(Auger Sample)				
	15.0	16.5	SS	9	6	9		1.0			Light brown fine to medium sand.
	15.0	20.0	HS								
	20.0	21.5	SS	6	10	14		1.5			Same with trace gravel.
	20.0	25.0	HS								
	25.0	26.5	SS	14	25	35		1.5			Same no gravel.
	25.0	30.0	HS								
	30.0	31.5	SS	29	39	37		1.5			Same (moist).
	30.0	35.0	HS								
	35.0	36.5	SS	17	29	46		1.0			Same (saturated).
	35.0	37.5	HS								Bail taken at 37', no oil observed.
	37.5	38.0	SS	9	10	14		0.5			Same
	38	39.0	SS					1.0			Gray sandy clay, grades to brown at tip.
	35.0	40.0	HS								
											EOB
											Monitoring well installed.
											See well installation diagram.

ABBREVIATIONS
F T - Fish Tail
W O - Wash Out
S T - Shelby Tube
S S - Split Spoon
D B - Diamond Bit
P A - Power Auger
R B - Rock Bit
W S - While Sampling
W D - While Drilling
B C R - Before Casing Removal
A C R - After Casing Removal
A B - After Boring

DRILL CREW CHECK LIST
Topsoil Thickness
Fill Thickness

CAVE IN LEVEL:
While Drilling and Sampling
After Boring Completion

WATER LOSS:
At To
Percent Loss
At To
Percent Loss

BOULDERS OR OBSTRUCTIONS:
At To
At To

ARTESIAN PRESSURE:
Depth
Height of Soil Rise In Casing

Piezometer PVC or SS
Diameter ___ in.
Screen Depth ___ ft to ___ ft
Riser Pipe ___ ft to ___ ft

MEN01818

Sheet 1 of 1

TECHNICIAN AMM
DRILLER MB
HELPER BP
RIG NO. B-61

SURFACE ELEV. 730.2'
BORING STARTED 9-28-88
BORING COMPLETED 9-29-88
STATION
OFF SET

STS Consultants Ltd. Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

CASING USED ____ SIZE ____

WATER LEVEL OBSERVATIONS
WL: 32'6" WS OR WD
WL: ____ BCR ____ ACR
WL: ____ AB ____ Hr. AB
WL: ____ 24 Hr. AB

JOB NO. 1123XF BORING NO. MW-103 CLIENT Menasha Corp.- Otsego WEATHER

Sample No.	Depth or Elevation From	To	Sampling Method	Penetration Record Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
	0	1.5	SS	2	12	21		.6			Brown sand with gravel.
	0	5.0	HS								
	5.0	6.5	SS	6	7	4		.6			Same
	5.0	10.0	HS								
	10.0	11.5	SS	3	4	4		0.0			Same with coarse gravel.
	10.0	15.0	HS				(Auger Sample)				
	15.0	16.5	SS	3	3	3		1.0			Brown sand with gravel-wet.
	15.0	20.0	HS								
	20.0	21.5	SS	3	3	4		1.5			Fine brown sand with some coarse sand-moist.
	20.0	25.0	HS								
	25.0	26.5	SS	11	11	8		1.0			Brown sand with gravel-wet.
	25.0	30.0	HS								
	30.0	31.5	SS	10	21	30		1.5			Light brown fine to medium sand.
	30.0	32.5	HS								
	32.5	34.0	SS	9	21	27		1'2"		32'6"	Same, saturated.
	32.5	35.0	HS								
	35.0	36.5	SS	10	25	25		9"			Same
							A	6"	1.5	36'	Brown sandy silty clay, trace gravel.
											EOB
											Monitoring well installed.
											See well installation diagram.

2 Feet

ABBREVIATIONS
F.T.-Fish Tail
W.O.-Wash Out
S.T.-Shelby Tube
S.S.-Split Spoon
D.B.-Diamond Bit
P.A.-Power Auger
R.B.-Rock Bit
W.S.-While Sampling
W.D.-While Drilling
B.C.R.-Before Casing Removal
A.C.R.-After Casing Removal
A.B.-After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ____
Fill Thickness ____

CAVE IN LEVEL:
While Drilling and Sampling ____
After Boring Completion ____

WATER LOSS:
At ____ To ____
Percent Loss ____
At ____ To ____
Percent Loss ____

BOULDERS OR OBSTRUCTIONS:
At ____ To ____
At ____ To ____

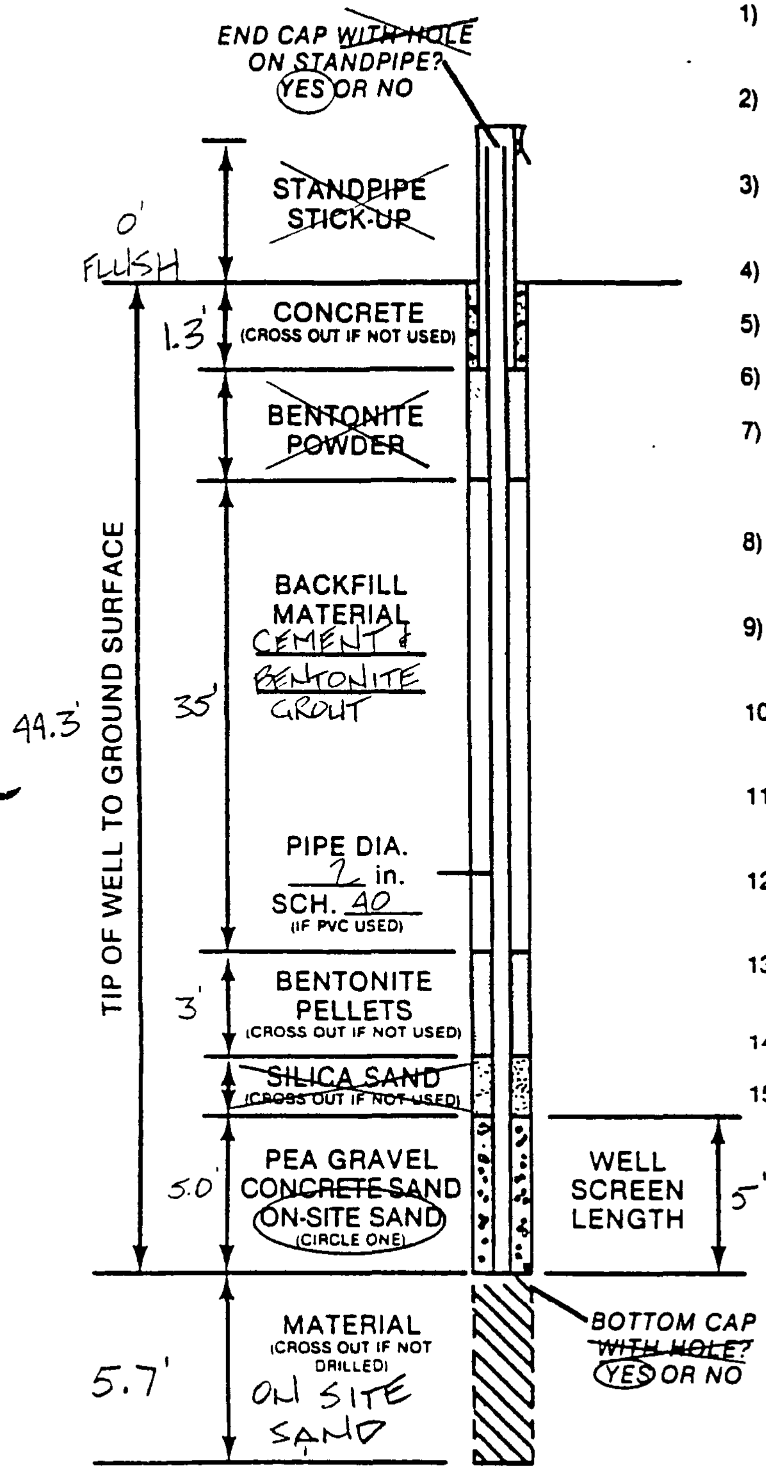
ARTESIAN PRESSURE:
Depth ____
Height of Soil Rise In Casing ____
Piezometer PVC or SS
Diameter ____ in.
Screen Depth ___ft to ___ft
Riser Pipe ___ft to ___ft

MEN01819

MEN01820

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED OTHER ______

3) TYPE OF WELL SCREEN
PVC GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE 0.10

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER
WATER, REVERT, ~~BENTONITE~~

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER 1.5 HRS.

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 40 GAL.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
______ Ft. or DRY

2) OTHER MEASUREMENTS:

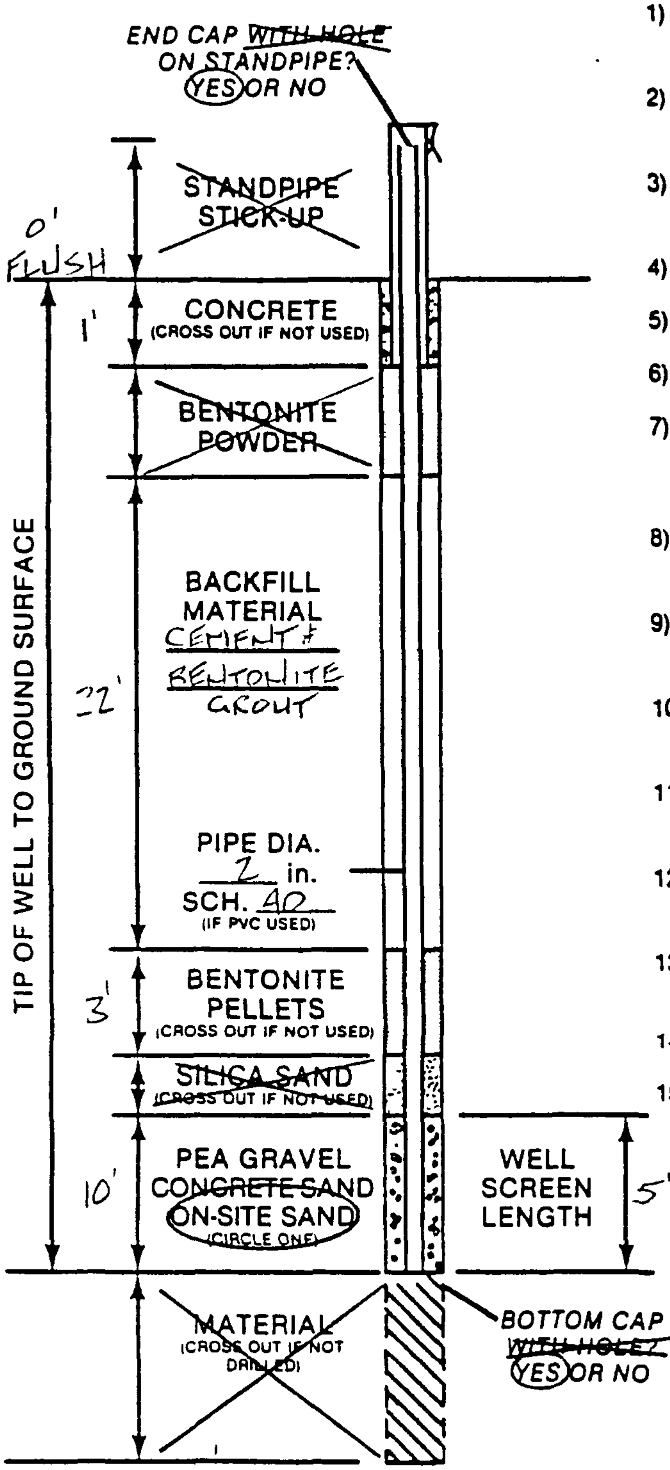
DATE 9-27 , 37'4" Ft. FROM T, ST. PIPE
DATE ______ , ______ Ft. FROM T, ST. PIPE
DATE ______ , ______ Ft. FROM T, ST. PIPE
DATE ______ , ______ Ft. FROM T, ST. PIPE

Well No. MW-101 DATE INSTALLED 9/26/88 DRILL RIG B-61
DRILLER BAKER DRILL CREW PENFIELD
JOB/CLIENT OTSEGO PLANT/MENASHA CORP. STS JOB No. 1123-XF
FW: 1-983

MEN01821

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SIZE 0.10

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER ________

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER ________

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
________ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

Well No. MW-102 DATE INSTALLED 9/27/83 DRILL RIG B-61

DRILLER BAKER DRILL CREW PENFIELD

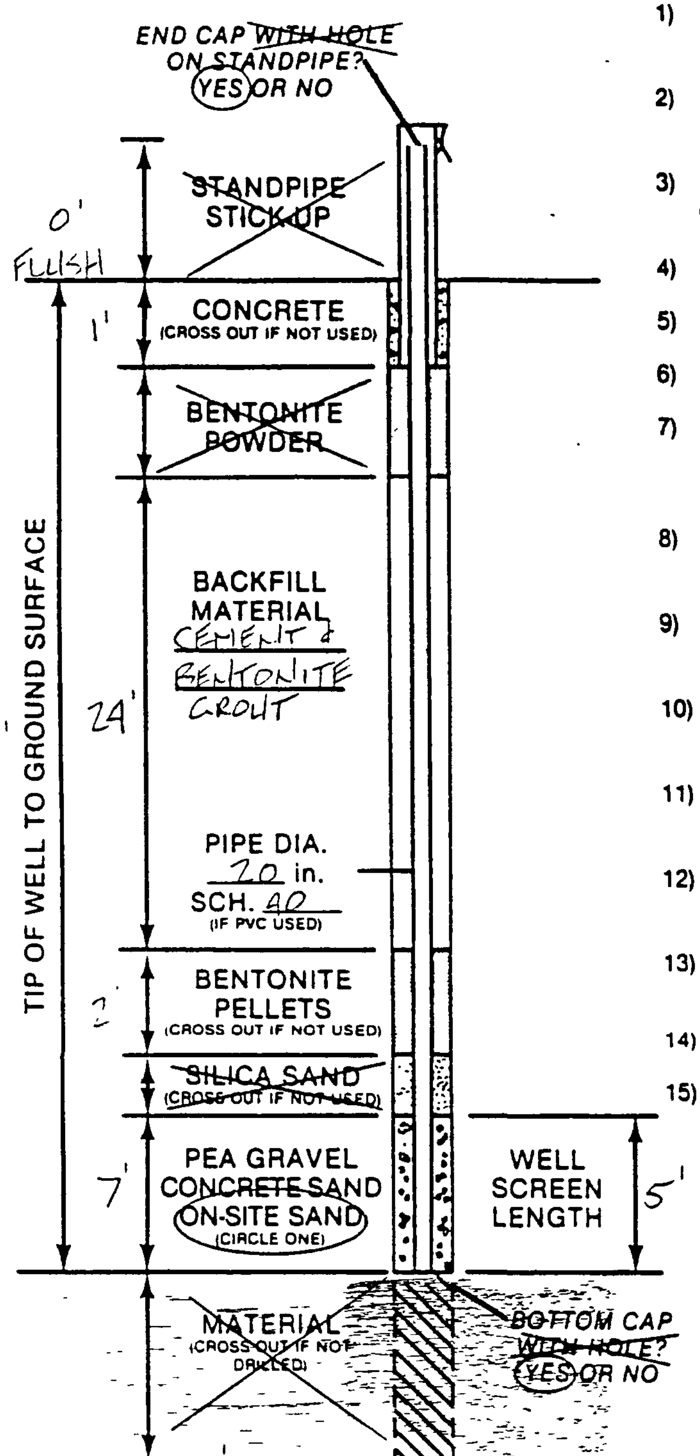
JOB/CLIENT OTSEGO PLANT/MENASHA CORP. STS JOB No. 1123-XF

FW- 1-983

MEN01822

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC GALVANIZED, STAINLESS, OTHER ________

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ________

4) SCREEN SIZE 0.10

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, ~~BENTONITE~~

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min, OTHER ________

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 2 GAL.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
________ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

DATE ________, ________ Ft. FROM T, ST. PIPE

Well No. MW-103 DATE INSTALLED 9/28/88 DRILL RIG B-61

DRILLER BAKER DRILL CREW PENFIELD

JOB/CLIENT OTSEGO PLANT/MENASHA CORP. STS JOB No. 1123-XF

FW: 1-983

Incorporate In Appendix C of Final Report

MEN01824

Fire & Environmental Consulting Laboratories, Inc.

One East Complex 1451 East Lansing Dr., Suite 222 East Lansing, MI 48823 (517) 332-0167

October 30, 1988

STS Consultants Ltd.
3340 Ranger Road
Lansing, MI 48806

Attention: Mr. Anne Murray

Analytical Laboratory Report

FECL #: 1758-88-E1-3

Samples Analyzed by: V. Murshak
Analyses Requested by: Anne Murray
P.O. #: Verbal

Samples Collected by:
Anne Murray
Date/Time Samples Submitted:
10/13/88

Submitting Company: STS Consultants Ltd.
3340 Ranger Road
Lansing, MI 48806

Project Description: 1123XF

FECL #: 01758-88-E1
Tag: Boring 101 S-9
Container: Glass Jars
Preservation: None
Sampling date/time: 10/13/88

FECL #: 01758-88-E2
Tag: Boring 102 S-8
Container: Glass Jars
Preservation: None
Sampling date/time: 10/13/88

FECL #: 01758-88-E3
Tag: Boring 103 S-8
Container: Glass Jars
Preservation: None
Sampling date/time: 10/13/88

MEN01825

Analytical Laboratory Report
STS Consultants Ltd.
FECL #: 1758-88-E1-3
October 30, 1988
Page Two

FECL #:	1758-88-E1	1758-88-E2	1758-88-E3
Tag:	B 101 S-9	B 102 S-8	B 103 S-8

Conventional Analyses

Oil and Grease	45.8 mg/kg	42.4 mg/kg	44.4 mg/kg

V. F. Murshak

Violetta F. Murshak
Labortory Manager

VFM/sp

MEN01826

Incorporate In Appendix F of Final Report

MEN01827

MENASHA CORPORATION
PAPERBOARD GROUP

Mr. Galen Kilmer
Michigan Dept. of Natural Resources
621 10th Street
Plainwell, MI. 49080

August 2, 1989

Dear Galen:

As Menasha has previously reported, the mill's #2 truck dumper periodically leaked enough hydraulic oil over a period of years to cause an oil plume to extend through the soil down to the first groundwater table. This letter is to update you on Menasha's most recent actions and plans regarding this problem. A full report will follow later.

In November 1987, several concrete containment structures were built at the #2 truck dumper to prevent any future oil leakage from entering the soil. This also had the effect of sealing the surface over part of the oil plume, which should have slowed its downward migration.

Additional subsurface exploration was commissioned by Menasha and performed in October, 1988. Three monitoring wells were installed, bringing to five the number of monitoring wells installed near the #2 truck dumper. The installation and subsequent chemical analysis of the monitoring wells indicated that groundwater in the region of the east truck dumper had not been significantly impacted by past hydraulic oil releases.

Based on recommendations from the consulting engineers, a low volume interceptor well was installed near the south edge of the oil contamination plume. This well has been fully operational since May, 1989. It is restricted to pumping only ½ gpm due to the very shallow aquifer above the clay lens, but has been shown to draw down the adjacent monitoring wells quite satisfactorily. This interceptor well serves to prevent any off-site migration of oil. To date, only trace amounts of oil have been pumped out, since very little oil has actually reached the groundwater.

It is Menasha's intent in September and October of this year to spend approximately $700,000 to replace the existing hydraulic screening system at the truck dumper with an electric system. This will eliminate the source of contamination from the screening system. As part of the demolition of the existing system, as much contaminated soil will be removed as possible without undermining nearby foundations.

OTSEGO MILL • 320 N. FARMER STREET • P.O. BOX 155 • OTSEGO, MICHIGAN 49078-0155 • PHONE: 616-692-6141

Menasha is currently considering the merits of installing a purging irrigation system to drive water through the remaining contaminated soil to move the residual oil down to where it can be captured by the interceptor well. Although we are not yet certain that an irrigation system is merited, we intend to install the appropriate piping during the upcoming excavation and backfilling before the new screening system is installed. Prior to any actual use of the irrigation system, Menasha would obtain appropriate permits as required from the MDNR.

Please let me know by August 18 if these steps do not meet your expectations for remedial action. Barring any comments, we will proceed as detailed above.

Sincerely,

Otsego Paperboard Division

John T. Bonham
Engineering/Technical Services Manager

JTB:amc

MEN01829

CAPITAL/REPAIR EXPENDITURE AUTHORIZATION

FORM 705

DIVISION Paperboard	PLANT OR LOCATION Otsego	EA- 229-0000-100
		DATE 10/6/89
PROJECT ADMINISTRATOR John Bonham	LIFE OF EQUIP.	EST. COMPL. DATE November 1989

PROJECT DESCRIPTION & PURPOSE
Remove some contaminated soils at #2 truck dumper. Install irrigation system for future flushing or bioremediation of hydraulic oil in ground. Take contaminated soils to landfill. Refill with clean sand.

DESCRIPTION OF EXPENDITURE	EQUIP. & MATERIAL	LABOR OUTSIDE	LABOR COMPANY	TOTAL
Install piling along truck dumper and hydraulic building. 80' X 10'				24,000
Remove 300 + 50 by bldg. yards of contaminated soil and take to a Type II landfill.				24,000
Design irrigation system.				5,000
Install irrigation system.				5,000
Refill with clean sand to grade of new truck dumper design. (Est. 85 yards)				200
3% contingency.				1,800
				60,000

APPROVED CAPITAL BUDGET AMOUNT $ 344,795
IF SINGLE BUDGET ITEM COVERING MULTIPLE ITEMS, INDICATE BUDGET AMOUNT REMAINING AFTER THIS REQUEST $ 110,950
(IF EA EXCEEDS CAPITAL BUDGET BY 5% OR MORE, EXPLAIN ______

ECONOMIC EVALUATION

INVESTMENT	
FIXED ASSETS	
PROJECT EXPENSE	60,000
WORKING CAPITAL	
TOTAL INVESTMENT	60,000

CASH PAYBACK	
PROFIT ON ADDED SALES	
COST REDUCTION OR AVOIDANCE	
LESS: DEPR. ON NEW EQUIPMENT	
PRE-TAX SAVINGS	
60% OF PRE-TAX SAVINGS	
ADD BACK DEPRECIATION	
CASH PAY-BACK	

BOOK VALUE DISPL. ASSETS (MEMO ONLY)

PAY-BACK	YRS.	MONTHS

PREPARED BY: Keith Kling *Keith L.B. Kling*

APPROVALS	DATE
PLANT MGR./PLANT ENGINEER *[signature]*	10-9-89
DIVISION ACCOUNTANT	
DIVISION MANAGER	
VICE PRESIDENT	
PRESIDENT	

USE REVERSE SIDE OF SHEET FOR SUPPORTING DETAILS ON SAVINGS. PREPARE ORIGINAL COPY ONLY. ORIGINAL WILL BE FORWARDED TO CONTROLLER AFTER APPROVAL AND WILL BE DISTRIBUTED BY CONTROLLER'S DEPT. PER STANDARD PROCEDURE #1015. IF E.A. IS DISAPPROVED, THE ORIGINAL COPY WILL BE RETURNED IN SAME ROUTING USED IN PREPARATION, BUT IN REVERSE ORDER.

NATURE OF EXISTING FACILITY

The #2 truck dumper is one of the two pieces of equipment used to empty wood chips from semis. It is powered by a number of hydraulic pumps and hoses.

WHERE INADEQUATE

There have been severe hydraulic leaks from this equipment over a period of years. Monitoring wells have been installed in several locations around the dumper. Oil has been found to a depth of 33 feet where the upper ground water level is located. This violates Michigan's rules against non-degration of ground water. To limit the problem, cement containment structures were built and an 8 inch well to contain the contamination was installed. This well holds the oil in place, but due to very slow oil migration, clean up by this method will not be accomplished.

PROPOSED REMEDY

The truck dumper screening system is going to be rebuilt to increase its capacity and to help limit further oil leaks. Most of the equipment will be changed from hydraulic to electric drive. This rebuild will be the only time in the next 10 to 15 years when some of the contaminated soil can be removed. It has been proposed to remove the most severely contaminated soil, install a series of PVC pipes for future irrigation or bioremediation and refill the area with clean sand. Enough soil should be dug out to install the irrigation system. This will require that approximately 1100 square feet of piling will have to be installed.

IMPACT ON MILL STRATEGIC PLAN

The original scope of this project was just to remove some surface contamination. A total of $60,000 was budgeted for this. Installation of pilings along the base of the truck dumper and the hydraulic equipment house will allow for installation of an irrigation system. The original pricing also did not include this. This has now been included as the best possibility for a relatively short, permanent clean-up. An additional added cost has been an increase in landfill costs from $10.50 to $16.50 per yard since the original planning for this project. To keep the project cost in line, less soil will be removed than was originally proposed.

OIL COMTAMINATION INVESTIGATION IN WOOD YARD

History of Problem

Truck dumper #2 was installed in 1981. The system consists of a truck dumping station and screening station to remove the large material and trash from the chips before putting them in the chip piles. The entire system is hydraulically operated from a central building which contains the hydraulic pumps and reservoirs. Ever since the system started up there has been a larger than normal leakage from the system. Some of this oil has been absorbed into oil dry and removed from the building, and some of the oil was absorbed into the wood chips that accumulate underneath the equipment. These chips were periodically removed so maintenance could be performed on the equipment. The actual volume of oil that has leaked from the equipment recently came to our attention and was several orders of magnitude greater than we had ever imagined. After allowing for the amount of oil that may have been removed by the oil dry and in chips, there is still more than enough left to be very concerned about a possibly significant ground and groundwater contamination problem. If the oil reaches the water table and begins spreading out on the surface of the water, it will be quite expensive to correct the problem. Since the further the oil spreads out, the more expensive it will be and the longer it will take to correct the problem, it is advantageous for us to begin the investigation and correction process as soon as possible.

Proposed Remedy

This REA will cover only the first phase of the investigation process. The consultants will collect the necessary background data, and then make one boring slightly down gradient from the source of the oil. If this boring indicates that the oil has reached the water, they will conduct a geophysical investigation to estimate the extent of the oil plume from the source. Several borings may be made to check the extent of the plume. The hydrogeologic report will then make recommendations as to further actions.

Phase II of the investigation which this REA does not cover, would include the design of the remedial actions necessary for cleaning up the contaminated soil and groundwater if necessary. Phase III would then consist of the execution of the remedial action plans.

MENASHA CORPORATION
PAPERBOARD GROUP

MEN01832

OTSEGO MILL
P O BOX 155
OTSEGO, MI 49078

(616) 692-6141

PURCHASE ORDER
THIS NUMBER MUST APPEAR ON ALL PACKING LISTS AND INVOICES

P O NO	[illegible]
P O DATE	[illegible]
P O PAGE	01

VENDOR
325 WEST FIRST STREET
PLAINWELL MI [illegible] 0

SHIP TO
P O BOX 155
320 North Farmer St
Otsego MI [illegible]

VENDOR NO	+77	SHIP TO CODE	00
SHIP VIA	BEST WAY	FOB	OUR PLANT
TERMS	NET 30	SALES TAX	NO
ORDER TYPE	NEW	REF. NO	
		ACCOUNT NUMBER	229-0000-100

BILL TO
Menasha Corporation
P O Box 155
320 North Farmer
Otsego MI 49078

CONFIRM

LN	ITEM NUMBER	DESCRIPTION	U/M	QUANTITY	DUE DATE	PRICE	TOTAL
01	ASK	INSTALL PILING ALONG FOOTINGS OF #2 TRUCK DUMPER	EA	1	10/25/8	24000 000	240[illegible]
02	ASK	REMOVE CONTAMINATED SOIL REFILL TO FINAL GRADE PART OF FILL TO BE STONE FOR IRRIGATION SYSTE FINAL COVER TO BE CLEAN SAND CRANE WORK TO BE CHARGED AT 130 0 HOUR HYDRAULIC HOE TO BE CHARGED AT 550 00/HR	EA	1	1 25 8	14000 000	1400[illegible]

For compliance with the OSHA standard on Hazard Communication, this purchase order requires that the vendor supply Material Safety Data Sheet(s) (MSDS) and warning labels on each and every different material listed The "MSDS" is to be furnished with the order acknowledgement the shipping papers and with the invoice Any order not in compliance with this request is subject to rejection and/or delayed payment until the MSDS is received

SPECIAL INSTRUCTIONS

PAGE TOTAL 38000.0[illegible]

PO TOTAL 38[illegible]

TO BE USED FOR

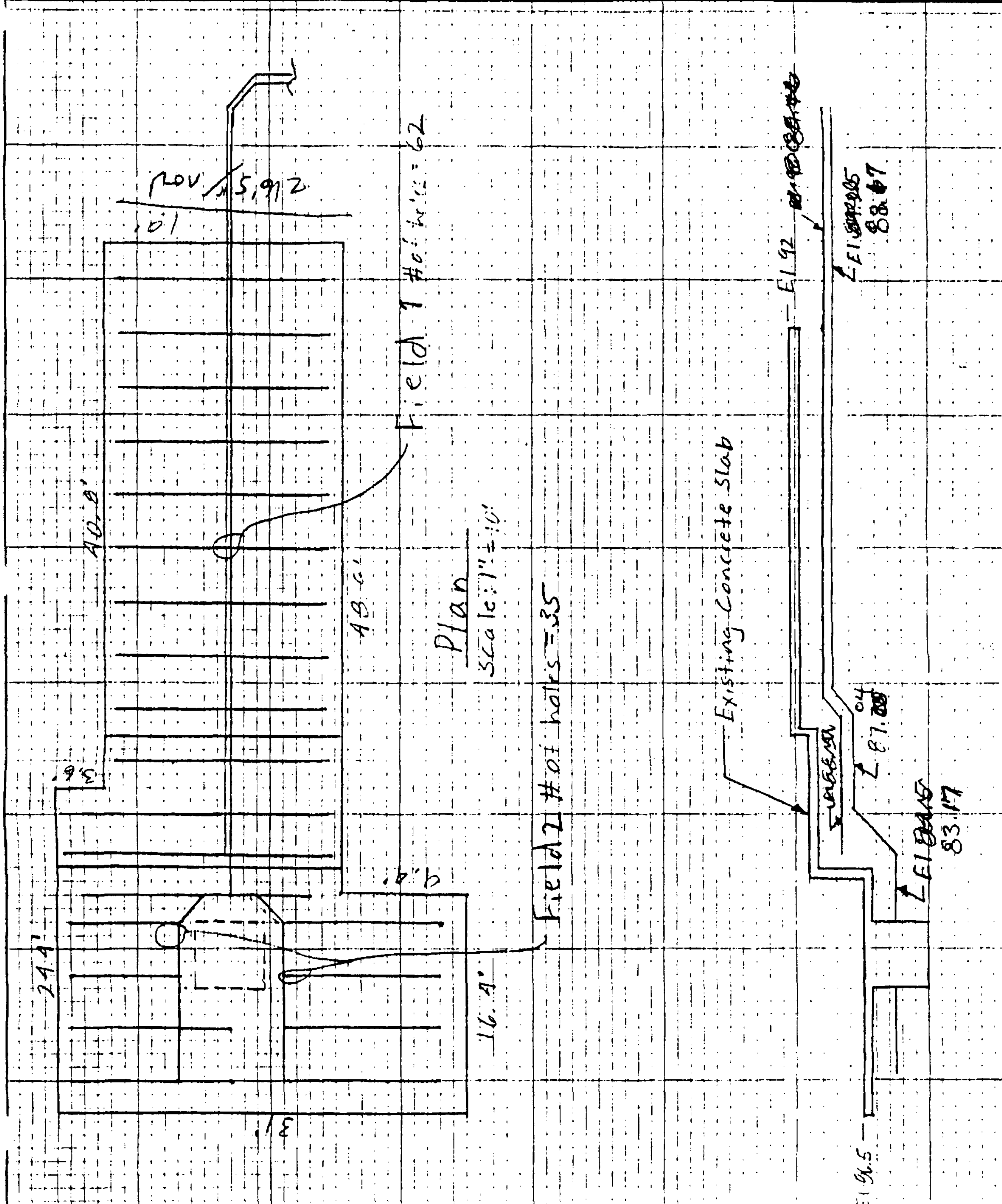
REQUISITIONED BY

X

AUTHORIZATION

STS Consultants Ltd.
CALCULATION SHEET

PROJECT		STS JOB NO.
Menasha	MEN01833	11-??-XF
SUBJECT		CALC. NO.
Stepped Fields		
DATE 10/25/9?	BY JEH	CHECKED BY	REV. NO.



518353
BRUNING

GEOTEXTILE SEPARATOR CONSTRUCTION NOTES

1. Grade the gravel upon which the geotextile separator is to be placed, and remove debris to provide a smooth, fairly level graded surface.

   a. Fill depressions and holes in the slopes which would cause the filter material to be torn during placement.

   b. Remove large stones, limbs, and other debris to prevent filter damage from tearing or puncture during placement.

2. Place separator loosely on graded surface, overlap seams for a minimum of a two (2) foot overlap.

3. Construct keys at limits of separator placement with one (1) foot overlap.

4. Contractor shall provide a woven geotextile separator, such as Mirafi ~~140N~~ 700X, which has been demonstrated to meet the specifications below.

Specification	Standard Test Procedure	Maximum or Minimum Requirement
Apparent Opening Size		70-100 sieve size (max.)
Grab Strength	ASTM D-1682	120 lbs. (min.)
Puncture Strength	ASTM D-751-68	65 lbs. (min.)
Burst Strength	ASTM D-3786	210 psi (min.)
Elongation at Failure	ASTM D-1682	50% (min.)
Permeability		.01 cm/sec (min)

5. If any defects, tears, gaps, etc. are observed, the section of fabric containing the defect should be repaired by placing a new layer of fabric extending beyond the defect in all directions, overlapping by a minimum of two feet. Alternatively, the defective section can be replaced.

GENERAL CONSTRUCTION NOTES

1. All piping and connections shall be Schedule 80 PVC which meets ASTM D-1785 Specifications. All adhesives used for connection shall meet ASTM D-2564 Specification.

2. When the irrigation filter bed has been excavated, at least 0.5 feet of gravel or crushed stone comparable to an MDOT coarse aggregate 9A, shall be placed in the bottom of the bed at uniform grade. The distribution line shall be carefully placed on the bed. The distribution lines shall be covered with at least one foot (1') of gravel. The material used to cover the stone shall be a geotextile separator fabric. Placement and description of this fabric is provided in the Geotextile Separator Construction Notes.

3. The irrigation filter bed shall be backfilled with material specified by Menasha Corporation for concrete pad base. Backfill shall be placed in nine inch (9") lifts and compacted to at least 95% of maximum dry density modified Proctor (ASTM D-1557). Backfill shall be placed over Geotextile Separator prior to any vehicle movement on fabric.

4. A clean sand shall be used for four inch (4") bedding and to the springline of the three inch (3") manifold line leading to the irrigation bed line. This portion of the backfill shall be placed by the controlled density method or other effective means having the approval of the engineer and shall be compacted to 95% of the maximum modified Proctor (ASTM D-1557). The remainder of the backfill shall be made with suitable uncontaminated, excavated material placed in one foot (1') layers, with each layer being thoroughly compacted by approved mechanical methods, to a density equivalent to the undisturbed adjacent soil.

5. Two (2) piezometers consisting of two inch (2") diameter schedule 80 PVC casing with two foot (2') #10 slot screen shall be placed within the irrigation filter bed. Screen shall be placed with PVC end cap at base of filter bed, and casing shall extend to surface of overlying concrete pad. A one foot (1') diameter, sealing cast iron manhole shall be flush-mounted in the overlying concrete pad.

✓

June 23, 1989

Mr. Keith Kling
Menasha Corporation
Otsego Paperboard Division
320 North Farmer Street
Otsego, Michigan 49078

RE: Addendum to Otsego Paperboard Plant Final Report
Results of Additional Hydraulic Oil Contamination Survey
STS Project No. 1123XF

Dear Mr. Kling:

Enclosed is the result of our subsurface exploration at the Otsego Paperboard Plant in Otsego, Michigan, performed in October, 1988. This report was completed under agreement by Menasha Corporation Purchase Order No. 4818499, dated August 2, 1987.

In general, this project was completed as an addendum to the Site Contamination Survey and Remediation Final Report dated August 1, 1988. Specifically, the project was performed to assess the extent of a hydraulic oil release at the east truck dumper at the Otsego, Michigan plant, and to develop recommendations for remedial measures.

Due to the quantity of additional information provided by this study, this report could not be incorporated into the body of the Final Report. Therefore, this report may be incorporated into Appendix G of the Final Report. The enclosed table of contents shall serve to update and ammend the existing table of contents of the Final Report. All additional enclosures may be placed within appropriate appendices. It should be noted that all references to appendices within the addendum will be in reference to those found within the Final Report.

1.0 Introduction

STS Consultants, Ltd. (STS) completed subsurface exploration program performed at the Otsego Paperboard Plant to assess the extent of hydraulic oil contamination in the area of the east truck dumper in June of 1986.

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing Michigan 48906
517.321.4964/Fax 517.321.2132

Recent increases in free product thicknesses in monitoring well MW-1 prompted the Menasha Corporation to review the site conditions at the east truck dumper and perform additional subsurface exploration. The additional subsurface exploration program included the drilling and installation of three (3) monitoring wells, elevation survey, and chemical analysis of soil and ground-water samples in order to estimate the impact of the hydraulic oil release downgradient and sidegradient of the truck dumper.

2.0 Field Exploration

The subsurface exploration program consisted of three soil borings utilizing a truck-mounted B-61 drill rig. These borings ranged in depth from 36.5 to 50 feet, and were performed using hollow stem augers.

During the drilling process, representative soil samples were collected using a split-barrel sampler in general accordance with ASTM Specification D-1586. Samples were collected and placed in clean, air-tight sample jars for further examination. Field logs of soils encountered in the boring were maintained by the drill crew. A typed version of these logs is included in Appendix B of the Final Report.

Clean protocol procedures were used during the drilling process to minimize cross-contamination. The cleaning procedures included the following steps:

a. Steam clean the back of the rig, sampling tools, casing, and screens prior to entering the site and between each boring.

b. Clean split-barrel soil sampler with tri-sodium phosphate and water between sampling.

c. Place soil samples in new, clean sample jars.

After drilling and preliminary soil classifications were completed, two inch diameter PVC monitoring wells with five foot of .01 inch slotted screens were installed in each soil boring. A natural sand pack was allowed to develop around the screen and bentonite seal was placed above the sand pack to minimize vertical migration of surface contamination. The wells were grouted to the surface with bentonite/cement slurry and fitted with flush-mounted sealed protector pipes. The well were developed by bailing utilizing a 5 foot PVC bailer.

Each well screen was set to intersect the groundwater to indicate the presence of hydraulic oil. Due to the presence of a sandy clay, the screen in MW-101 was set below the sandy clay, in order to assess vertical flow gradients across the sandy clay, if present. Monitoring well installation diagrams for each well are also enclosed in Appendix B of the Final Report.

Upon completion of the well installation. a survey was performed to estimate the elevation of the ground surface and well casing. Additionally, the location of these wells were added to the base map designated as Drawing 1, and enclosed in Appendix F of the Final Report. A summary of the well installation is presented below in Table 1.

TABLE 1
Summary of Well Installations

Well Designation	*Elevation (feet) Top of PVC Pipe	Ground Surface	Top of Screen	Bottom of Screen
MW-101	729.77	730.0	690.5	685.5
MW-102	728.13	728.5	693.1	688.0
MW-103	729.99	730.2	699.9	694.9

* Elevations referenced to a benchmark described as chisled X on floor of switch room 24.

3.0 Chemical Laboratory Analysis

An analytical testing program for both groundwater and soil samples was undertaken for this project.

One soil sample from each of the three soil borings was returned to Fire and Environmental Control Laboratories (FECL) in East Lansing, Michigan. The soil samples were selected from each boring to represent the upper surface of the groundwater. The results of the oil and grease analysis of the soil samples is presented in Table 2. A complete laboratory report is enclosed in Appendix C of the Final Report. Low levels of oil and grease was detected within each soil sample.

TABLE 2
Analytical Results

Soil Sample	Depth (ft.)	Oil & Grease (mg/kg)
MW-101 S-9	37.5-39.0	45.8
MW-102 S-8	35.0-36.5	42.4
MW-103 S-8	32.5-34.0	44.4

Menasha personnel collected groundwater samples from each of the three wells for oil and grease analysis. The results of these analyses were less than one part per million (ppm) of oil and grease for each well.

4.0 Hydrogeologic Analysis

On October 12, 1988, static water levels were measured in the three recently installed wells, MW 101, 102 and 103. The groundwater elevation summary is presented in Table 3.

TABLE 3
Summary of Groundwater Elevations of October 12, 1988

Well Designation	Depth to Water (ft)	Elevation* (ft)	
		Casing Top	Groundwater
MW-101	34.82	729.77	694.95
MW-102	31.75	728.13	696.38
MW-103	34.67	729.99	695.32

* Elevation referenced to benchmark described as a chisled X on floor of switch room 24.

The results of the three borings at the site indicate that downgradient of MW-1 the sandy clay unit appears to shallow to above groundwater surface, as indicated in the original study performed at the east truck dumper. Although, the groundwater elevation beneath the clay layer does not greatly differ from the groundwater elevation above the clay suggesting the clay layer may not provide a confining layer. Additionally, from the results of the chemical analysis, it appears that hydraulic oil has been transported into the clay layer at some time. However, as oil and grease were not detected in the groundwater samples, and free product was not observed in the new wells, this indicates that the recent increase of free product in MW-1 has not significantly impacted groundwater downgradient or sidegradient of the source at this time.

5.0 Summary, Conclusions, and Recommendations

The installation and subsequent chemical analysis of the monitoring wells, indicate that, presently, groundwater in region of the east truck dumper has not been significantly impacted by past and recent hydraulic oil releases. Additionally, the subsurface exploration indicated a sandy clay just below the groundwater at MW-1 appears to shallow downgradient. The presence and extent of this clay layer would reduce the ability of a large downgradient recovery well to remove free product from the groundwater.

Due to this clay layer, STS recommends the installation of a smaller recovery well near the source the contamination to remove free product from the surface of the groundwater in addition to contaminated groundwater. However, it appears a large amount of oil exists as residual within the unsaturated soil zone. In order to remove this oil, STS recommends the installation of a purging irrigation system. This system would drive water through the contaminated soil, taking with it some of the residual oils. Often to aid the purging process, surfactants are added to the water to facilitate the oil movement through the unsaturated zone. The additional water would be removed using all groundwater recovery well and pumped to an auto-skimming system. The merits of the irrigation system could be evaluated after all planned structural changes are made in the vicinity of the truck dumper.

We appreciate the opportunity to continue the study with you. If you have any questions or comments, please do not hesitate to contact us at (800) 444-4261.

Sincerely,

STS CONSULTANTS, LTD.

Anne M. Murray

Anne M. Murray
Environmental Geologist

Bernard B. Sheff, P.E.
Senior Project Engineer
Area Manager

AMM/lch AMM3 #30

Enclosure

STS Consultants Ltd.
Consulting Engineers

AQUIFER ANALYSIS HYDRAULIC OIL REMEDIATION EAST TRUCK DUMPER OTSEGO, MICHIGAN

THE MENASHA COMPANY
OTSEGO, MICHIGAN

REPORT

September 28, 1990

Mr. Keith Kling
Menasha Corporation
320 North Farmer Street
Otsego, Michigan 49078

RE: Results of Aquifer Analysis, Hydraulic Oil Remediation, East Truck Dumper, Otsego Paperboard Plant - STS Project No. 1183-XF

Dear Mr. Kling:

As you are aware, aquifer analysis was performed in conjunction with the installation of a purge well for the above referenced project. This project was performed as a follow-up service for the design and installation of the East Truck Dumper remediation system. This work was completed under Menasha's purchase order no. 483826.

STS apologizes for the delay in forwarding this data. If you have any questions, please contact me at (517) 321-4964.

Sincerely,

STS CONSULTANTS, LTD.

Anne M. Murray
Project Hydrogeologist

Bernard B. Sheff, P.E.
Principal Engineer
Regional Office Manager

AMM/lch AMM 12-11

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
517.321.4964/Fax 517.321.2132

MEN01843

Report

Project

Results of Aquifer Analysis
Hydraulic Oil Remediation, East Truck Dumper
Otsego Paperboard Plant

Client

Menasha Corporation
320 North Farmer Street
Otsego, Michigan 49078

Project # 1183-XF

Date September 28, 1990

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing Michigan 48906
(517) 321-4964

TABLE OF CONTENTS

FIGURES

APPENDIX

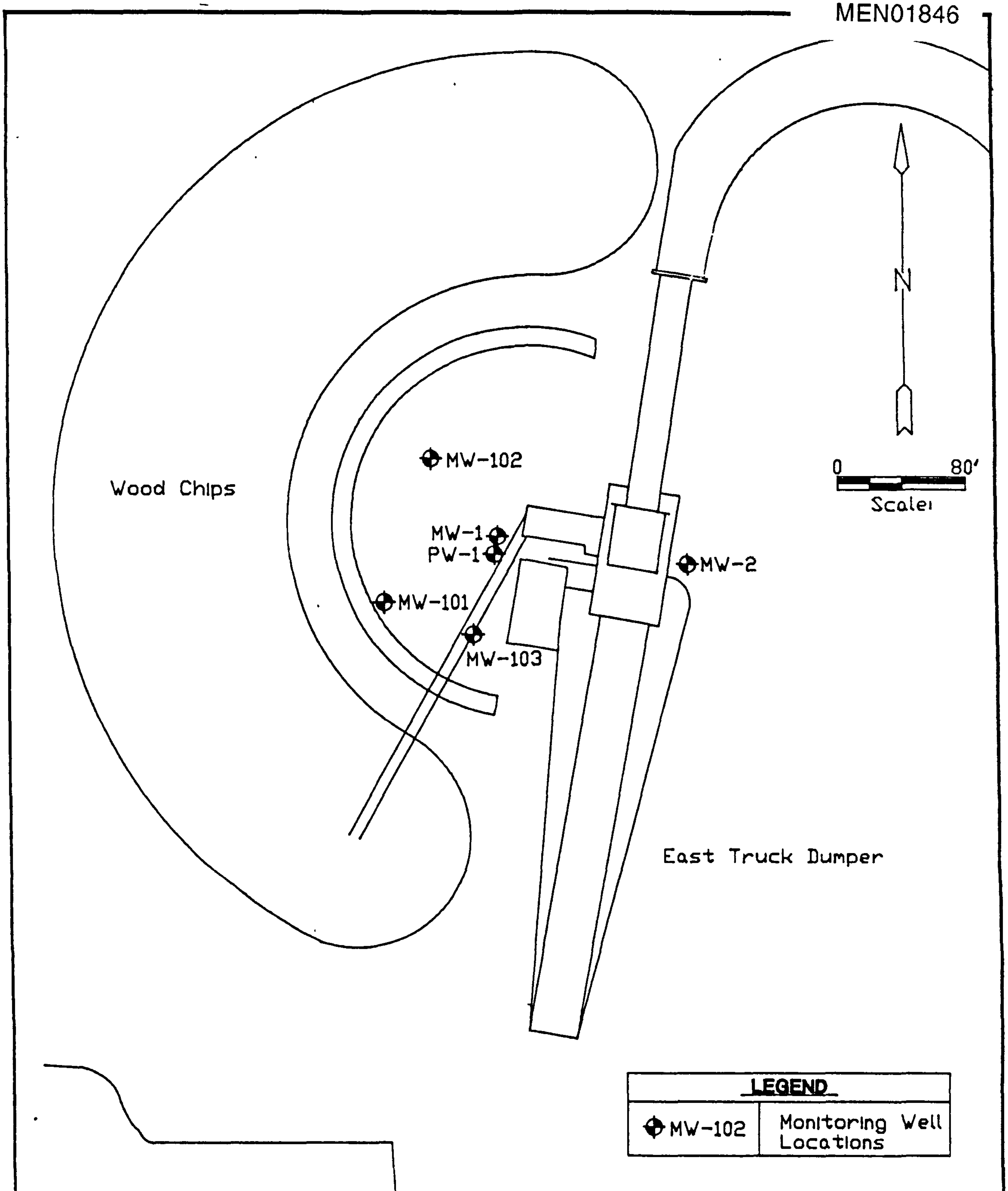
AQUIFER ANALYSIS RESULTS
HYDRAULIC OIL REMEDIATION. EAST TRUCK DUMPER
OTSEGO PAPERBOARD PLANT

1.0 PROJECT OVERVIEW

Previous studies at the East Truck Dumper at the Otsego Paperboard Plant had indicated contamination from hydraulic oil in soil and groundwater (Reference 1 and 2). In January of 1989. after the discovery of hydraulic oil in monitoring well MW-1. an 8-inch well was installed to recover and control any hydraulic oil release in groundwater at the truck dumper. Purge well. PW-1 was installed approximately 8 feet down-gradient of MW-1. utilizing cable tool drilling techniques (Figure 1). Due to the presence of a sandy clay layer approximately 5 feet below the groundwater surface. the well screen was installed at the clay layer to collect oil contamination above the clay lens. The well was developed by pumping. and a pumping rate of approximately 0.5 gallons per minute (gpm) after development was recorded.

Regarding the soil contamination. a subsurface irrigation system was installed upgradient to purge the hydraulic oil from the unsaturated zone in Fall. 1989 (Figure 2). As this irrigation system would add substantially more water to the groundwater system. a long-term pumping test was to be performed to evaluate hydraulic control at the site. In general. the existing groundwater flow direction indicated on Figure 2. will be impacted locally after implementation of the pump and irrigation system. Therefore. to provide additional information concerning the permeability of the aquifer. and impacts to the static water table. STS performed single well conductivity testing of the purge well PW-1 and monitor well MW-102. The results of the pump test. conductivity testing ands evaluation to those results are included in the following report.

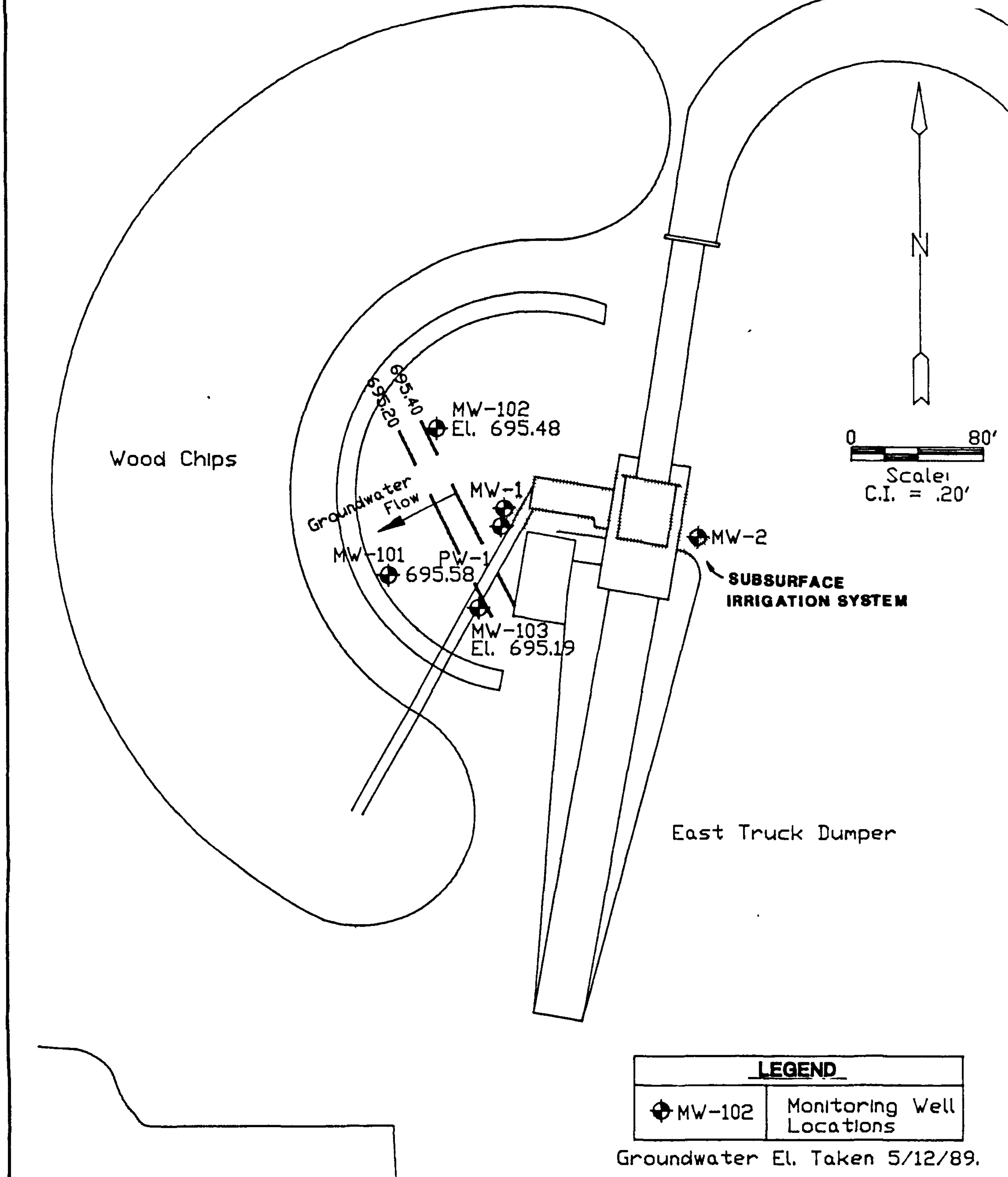
MEN01846



STS Consultants Ltd.
Consulting Engineers

WELL LOCATION DIAGRAM
EAST TRUCK DUMPER
HYDRAULIC OIL REMEDIATION
OTSEGO, MICHIGAN
THE MENASHA CORPORATION

DRAWN BY	JET	9/90
CHECKED BY	AMM	9/90
APPROVED BY	BBS	9/90
SCALE 1"=80'	FIGURE NO. 1	
STS DRAWING NO. 1183XF		



STS Consultants Ltd.
Consulting Engineers

GROUNDWATER ELEVATION DIAGRAM
EAST TRUCK DUMPER
HYDRAULIC OIL REMEDIATION
OTSEGO, MICHIGAN
THE MENASHA CORPORATION

DRAWN BY	JET	9/90
CHECKED BY	AMM	9/90
APPROVED BY	BBS	9/90
SCALE 1"=80'	FIGURE NO. 2	
STS DRAWING NO. 1183XF		

2.0 SCOPE OF WORK

On May 15, 1989, a QED pulse pump was installed in the purge well. Prior to pumping, water levels were recorded in monitoring wells MW-101, MW-102, MW-103, and in purge well PW-1 (Figure 1). During the initial two weeks, difficulties with setting the pump limited the accessory of the data and new pump test data was required. Therefore, at the end of May, a data logger transducer was installed in MW-102, as the presence of free product in MW-1 limited the use of the transducer in this well. As a further complicating factor, on May 31, 1989, approximately four inches of rain was recorded in the area, affecting general water levels, particularly in MW-102, which is suspected to have been exposed to surficial runoff due to the transducer installed within the well. After the rain event, substantial increases in water levels in not only MW-102, but all wells were noted. As an aside, the rain event impacted the transport of oil to the purge well as visible product was seen in the discharge after the rain event.

To provide a supplement to this data, single well hydraulic conductivity tests or "slug" tests, were performed in MW-102 and PW-1. These data were used to estimate permeability of the aquifer.

Finally, the scope of work included the evaluation of the pump test data, permeability data, and previous geologic and site hydrogeology data in developing a capture zone for the recovery well. As part of this evaluation, the impact of the irrigation system would be evaluated.

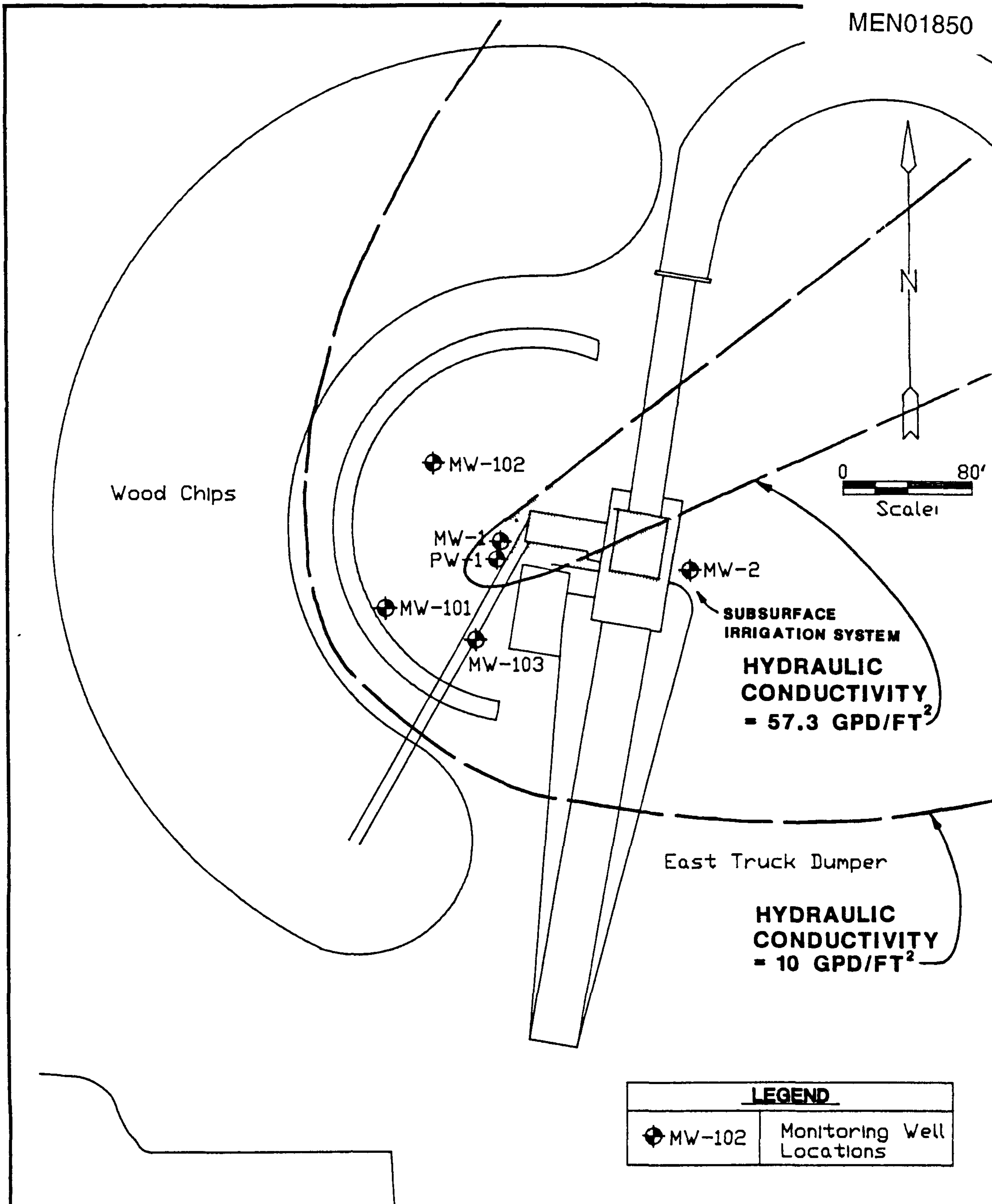
3.0 RESULTS

Due to difficulties in the use of the data logger for recording water levels in MW-102, including the introduction of surface water, limited data was available for analysis. Therefore, to estimate the permeability of the aquifer, a Theis non-equilibrium type fit curve was utilized with data collected from MW-1 for the original pumping from the purge well for approximately 1.5 hours. The analysis of the Theis match are presented in the Appendix. In general, the results indicate of permeability of 10.31 gpd/ft² = 4.89 x 10^{-4} cm/sec, with a storativity of .024.

To provide validity for these permeabilities, single well conductivity tests were performed on October, 1989. This data was analyzed by the Horslev method to estimate hydraulic conductivity. The analysis of the rising well test for MW-102 permeability is 7.2 x 10^{-3} cm/sec or 153 .4 gpd/ft². The analysis for PW-1 is 4.5 x 10^{-4} cm/sec. or 9.8 gpd/ft². If is important to note that the sands encountered at MW-102 are generally coarser with lesser amounts of silt than the soils at MW-1 or PW-2. The permeability results tend to verify these textural differences.

These permeability results were utilized to estimate a capture zone for this pumping well. It is estimated using a method developed by superposition utilizing the groundwater gradient, permeability, aquifer thickness, and pumping rate. Using a pumping rate of 0.5 gpm, a groundwater gradient from Figure 2 of 0.02, an estimated aquifer thickness of 5 feet, and a hydraulic conductivity of 10 gpd/ft, the capture zone will extend approximately 114 feet downgradient of PW-1, as shown on Figure 3. This estimate assumes that the clay lens is continuous for this distance. It also assumes the hydraulic conductivity of the soil is isotropic. However, as shown by the slug test of MW-102, the potential for a higher hydraulic conductivity exists. To provide a conservative estimate of permeability, the three permeabilities were averaged to a value of 57.3 gpd/ft². This capture zone is also presented in Figure 3. This capture zone would not encompass the area upgradient in which the irrigation system has been installed.

MEN01850



STS Consultants Ltd. Consulting Engineers	**CAPTURE ZONE DIAGRAM EAST TRUCK DUMPER HYDRAULIC OIL REMEDIATION OTSEGO, MICHIGAN THE MENASHA CORPORATION**	DRAWN BY JET	9/90
		CHECKED BY AMM	9/90
		APPROVED BY BBS	9/90
		SCALE 1"=80'	FIGURE NO. 3
		STS DRAWING NO. 1183XF	

As seen from Figure 3. the capture zone based on the higher hydraulic conductivity at MW-102 decreases the effective capture zone and would not appear to show capture at MW-2. However. it should be noted that the distinct soil differences were indicated between the sands at MW-102 and at the pumping well and at MW-1. Secondly. the clay layer on which PW-1 was placed. rises substantially to the south and west. Specifically, previous studies was shown that less than 40 feet south of PW-1. the clay surface rises above the water table and PW-103 only has 1 1/2 to 2 feet of water above the clay layer. This reduction in aquifer thickness to the south and west violates the calculation assumptions of infinitely thick large aquifer of 5 feet saturated thickness. Restricting the amount of water which can be drawn to the south and west of the monitoring well. the capture zone would then be increased in the direction upgradient and away from the well. The capture zone calculated based on the lower permeability at PW-1 would appear to be more realistic of the actual in-field conditions. Therefore. it would all be expected that the capture would extend over to the area of MW-2 for an increased vertical seepage. on the order of a 1/2 gallon per square foot per day of irrigation bed is added to soils above the capture zone, the resulting reaching the water table should be captured by PW-1.

4.0 RECOMMENDATIONS

Hydraulic oil contamination was identified in the soils and groundwater at Truck Dumper No. 2 at the Menasha Otsego Paperboard Plant in early 1986. Studies performed at the site since that time have indicated a small clay lens exists below Truck Dumper No. 2 which has appeared to collect the hydraulic oil has is seeped towards the water table in this vicinity. The purpose of this study was to evaluate the pumping well installed in January of 1989 for aquifer properties. Due to several difficulties with data collection. additional single well conductivity tests were performed in order to further evaluate the aquifer in the area. In general. the results of this study in conjunction with the previous indicate that the pumping well recovered in January of 1989 is sufficient and will affect a significantly wide capture area that the hydraulic oil contamination area should be controlled. Furthermore, seepage from a subsurface irrigation system placed below the truck dumper as a method of affecting vertical migration of the oil trapped in the soil below the truck dumper should be collected. STS recommends that the monitoring program be initiated and that a groundwater monitoring program be initiated and that the pulse pump be re-installed in PW-1. A permanent discharge system should be set up to handle flows in the range of 2.000 to 2.500 gallons per day from the pulse pump. Furthermore. STS recommends that Menasha paperwork for securing a groundwater discharge permit from Michigan Department of Natural Resources under Part 22 of Act 245 the Water Resources Commission Act. When the groundwater discharge permit has been secured. STS recommends that steady state conditions be obtained with the pumping system prior to the operation of the irrigation system.

5.0 GENERAL QUALIFICATIONS

STS Consultants. Ltd. was retained by the Menasha Corporation to evaluate the purge well control for the hydraulic oil remediation at the site. The information was obtained from the field exploration performed by STS.

The conclusions of this report are based on data which is presented in the report. Data was collected for the purposes outlined in this report. and should not be used for reasons other than those intended. No other warranty of any kind. expressed or implied. at common law or created by statute. is extended. made. or intended by the rendition of consulting services or by furnishing oral or written reports of the findings made.

REFERENCES

1. Otsego Paperboard Plant: Site Contamination Survey and Remediation Study -- Final Report -- Menasha Corporation: STS Consultants, Ltd. Project No. 1123-XF, August 1, 1988.

2. Addendum to Otsego Paperboard Plant Final Report -- Results of Additional Hydraulic Oil Contamination Survey -- STS Consultants, Ltd. Project No. 1123-XF, June 23, 1989.

MEN01855

STS Consultants Ltd. CALCULATION SHEET	PROJECT MENASHA - HYDRAULIC OIL REMEDIATION	STS JOB NO. 1183XF
	SUBJECT Theis Type Curve Aquifer Analysis	CALC. NO. 1/9
	DATE 9/90 BY AMM CHECKED BY PBJ	REV. NO.

1.0 Introduction

A pumping test was performed within an well installed at Menasha's East Truck Dumper. The test was to be a long term drawdown test. Due to data collection and pump difficulties the data analized is collected from short term pumping (75 minutes from pumping) at a radius of 8 feet.

The data was collected in MW-1 approximately 8 feet from the purge well PW-1. The test was analized using the Theis Type curve analysis for hydraulic conductivity and storativity.

MEN01856

STS Consultants Ltd. CALCULATION SHEET	PROJECT MENASHA - HYDRAULIC OIL REMEDIATION	STS JOB NO. 1183XF
	SUBJECT AQUIFER ANALYSIS	CALC. NO. 2/9
DATE 9/90	BY AMM	CHECKED BY [illegible]	REV. NO. 1

2.0 Hydrogeologic setting

An eight inch diameter purge well was installed into a thin aquifer system at the East Truck Dumper to develop a capture zone to remove hydraulic oil found as free product in MW-1 and expect throughout the area.

The area contain a thin fine sand aquifer of ~~less~~ than 5 feet in thickness above a 5-10 foot Sandy clay, although this clay may pinch out for the purpose of analysis, this configuration was assumed consistent. The depth to water is approximately 25 feet to 35' dependant on ground surface.

STS Consultants Ltd. CALCULATION SHEET	PROJECT: MENASHA - HYDRAULIC OIL REMEDIATION	STS JOB NO.: 1183XF
	SUBJECT: Aquifer Analyses	CALC. NO.: 3/9
DATE: 9/90	BY: AMM	CHECKED BY: [illegible]	REV. NO.

3.0 DATA

As described before, the pumping well provides only ~ 0.5 gpm which was to be assessed in a long term analysis. However, data collection problems limited data collection. Therefore data collected on May 12, 1989 with original pumping were utilized for this analysis

MW-1 DRAWDOWN (FT)	Time (MINS) From pumping Start
.02	38
.11	75'
.13	85

ING 4

MEN01858

STS Consultants Ltd. CALCULATION SHEET	PROJECT MENASHA- HYDRAULIC OIL REMEDIATION	STS JOB NO. 1183XF
	SUBJECT Aquifer Analysis	CALC. NO. 4/9
	DATE 9/90 · BY AMM · CHECKED BY [illegible]	REV. NO.

3.0 Data Analysis

A Theis type curve analysis was utilized for this analysis because ~~of~~ the data was collected during the early stages of pumping. As the Monitor well MW-11 is at a short distance from the pumping well an time was short. The theis match was not corrected for unconfined aquifer dewatering

The $Q = 0.5$ gpm
$b = 5.0$ ft
$r = 8$ feet

BRUNING 45-1 9353

MEN01859

PROJECT			STS JOB NO.
MENASHA- HYDRAULIC OIL REMEDIATION			1183XF
SUBJECT: Aquifer Analysis			CALC. NO. 5/9
DATE 9/90	BY AMM	CHECKED BY PBL	REV. NO.

STS Consultants Ltd.
CALCULATION SHEET

NONEQUILIBRIUM WELL EQUATION

Theis developed the nonequilibrium well equation in 1935. The Theis equation was the first to take into account the effect of pumping time on well yield. Its derivation was a major advance in groundwater hydraulics. By use of this equation, the drawdown can be predicted at any time after pumping begins. Transmissivity and average hydraulic conductivity can be determined during the early stages of a pumping test rather than after water levels in observation wells have virtually stabilized. Aquifer coefficients can be determined from the time-drawdown measurements in a single observation well rather than from two observation wells as required in Equations 9.3 and 9.4.

Derivation of the Theis equation is based on the following assumptions:

1. The water-bearing formation is uniform in character and the hydraulic conductivity is the same in all directions.
2. The formation is uniform in thickness and infinite in areal extent.
3. The formation receives no recharge from any source.
4. The pumped well penetrates, and receives water from, the full thickness of the water-bearing formation.
5. The water removed from storage is discharged instantaneously when the head is lowered.
6. The pumping well is 100-percent efficient.
7. All water removed from the well comes from aquifer storage.
8. Laminar flow exists throughout the well and aquifer.
9. The water table or potentiometric surface has no slope.

These assumptions are essentially the same as those for the equilibrium equation except that the water levels within the cone of depression need not have stabilized or reached equilibrium.

In its simplest form, the Theis equation is:

$$s = \frac{114.6\,Q\,W(u)}{T} \qquad\qquad s = \frac{1}{4\pi}\frac{Q}{T}W(u) \qquad (9.5)$$

where

s = drawdown, in ft, at any point in the vicinity of a well discharging at a constant rate
Q = pumping rate, in gpm
T = coefficient of transmissivity of the aquifer, in gpd/ft
$W(u)$ = is read "well function of u" and represents an exponential integral

where

s = drawdown, in m, at any point in the vicinity of a well discharging at a constant rate
Q = pumping rate, in m^3/day
T = coefficient of transmissivity of the aquifer, in m^2/day
$W(u)$ = is read "well function of u" and represents an exponential integral

In the $W(u)$ function, u is equal to:

$$u = \frac{1.87r^2S}{Tt} \qquad\qquad u = \frac{r^2S}{4Tt} \qquad (9.5a)$$

where

r = distance, in ft, from the center of a

where

r = distance, in m, from the center of a

BRUNING 45-111 53

pumped well to a point where the drawdown is measured

S = coefficient of storage (dimensionless)

T = coefficient of transmissivity, in gpd/ft

t = time since pumping started, in days

pumped well to a point where the drawdown is measured

S = coefficient of storage (dimensionless)

T = coefficient of transmissivity, in m^2/day

t = time since pumping started, in days

The well function of u [$W(u)$] originated as a term to represent the heat distribution in a flat plate with a heating element at its center. Theis recognized that this same concept could be applied to the regular distribution of the groundwater head around a pumping well even though water flows toward the point source rather than away from it. The mathematical principles remain the same.

Analysis of pumping test data* using the Theis equation can yield transmissivity and storage coefficients for all nonequilibrium situations. In actual practice, however, the Theis method is often avoided because it requires curve-matching interpretation and is somewhat laborious. In fact, the work of applying the Theis method can be avoided in most cases. For example, if the pumping test is sufficiently long or the distance from the well to where the drawdown is measured is sufficiently small, the $W(u)$ function can be replaced by a simpler mathematical function which makes the analysis easier. The Theis method is developed at the end of this chapter, but at this point the simplified version is examined because it serves well in most cases.

The data points are graphed logrithmically

Drawdown vs time on graph

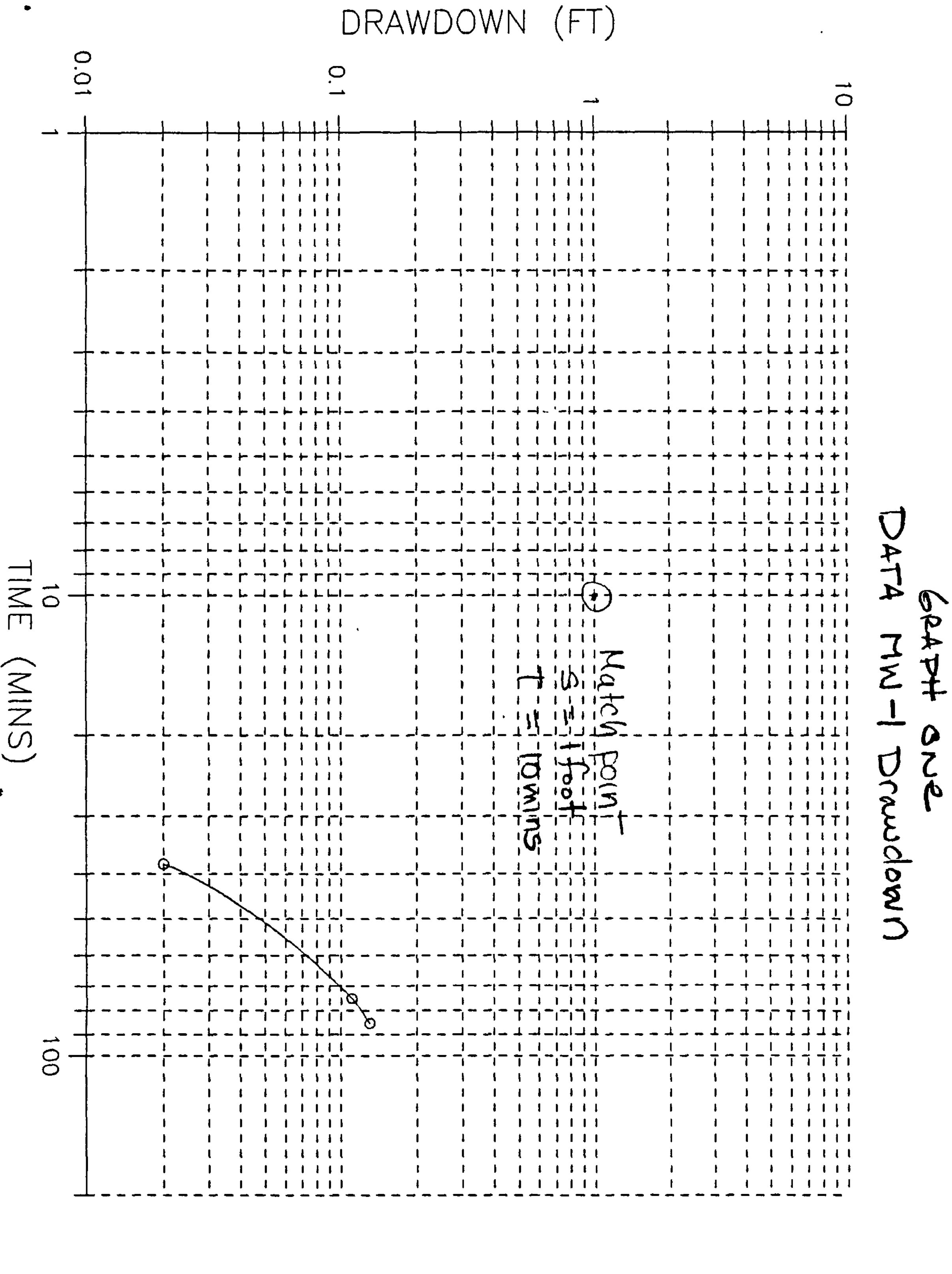
This was matched with the

Well function plot of W(u) vs 1/u.

The resulting match point is

$W(u) = .9$ $\quad$ $s = 1$ foot

$u = 8$ $\quad$ $t = 10$ mins


DRAWDOWN (FT)
0.01
0.1
1
10
TIME (MINS)
1
10
100
GRAPH ONE
DATA MW-1 Drawdown
Match point
S = 1 foot
T = 10 mins

STS Consultants Ltd.
CALCULATION SHEET

PROJECT	STS JOB NO.
MENASHA - HYDRAULIC OIL REMEDIATION	1183XF
SUBJECT: Aquifer Analysis - Hydraulic Oil Remediation	CALC. NO. 9/9
DATE 9/90 · BY ADM · CHECKED BY	REV. NO.

TRANSMISSIVITY

$$T = \frac{114.6\,Q}{S} W(u)$$

W(U) = .9
S = 1 foot
Q = .5 gpm

= 51.57 gpd/FT

STORATIVITY

$$S = \frac{u\,T\,t}{1.87 r^2} =$$

U = 8
T = 51.57 gpd/FT
t = 10 mins = .007 days
r = 8 FT

$$S = \frac{8 \times 51.57 \times .007}{1.87 \times 8^2}$$

= .024

4.0 SUMMARY

TRANSMISSIVITY 51.57 gpd/FT b = 5'
= Kb

Hydraulic conductivity = 10.31 gpd/FT^2

Storativity = .024

MENASHA CORPORATION

PLANT OR LOCATION

TO Len Myers CC John Bonhas MEN01863 2/20 1991

AT

MESSAGE

SUBJECT Oil Spills

Last night, broken lines at both #1 + #2 Truck Dumper resulted in oil spills. ~~At~~ #1 this ran into the parking lot. It has been contained by putting a layer of fines over it. Please take the following cleanup steps.

- Have Mick Disposal bring in a dumpster for fines.
- Empty all berms of as much rain water as possible.
- Have safety kleen pump out oil if necessary.
- Final parking lot clean up should be completed w/ sweeper

SIGNED [redacted]

ORIGINATOR WRITE MESSAGE IN UPPER PORTION ONLY SNAP OUT YELLOW COPY FOR FOLLOW UP

REPLY

KBK - Ordered 30yd box

KBK - Called Westside for approval.

Len - Safety Kleen will not be needed.

SIGNED

RECEIVER REPLY ON LOWER PORTION RETAIN PINK COPY - RETURN WHITE COPY TO SENDER

SENDER'S FILE COPY

PAPERBOARD DIVISION

MENASHA CORPORATION

February 25, 1991

Orchard Hill Landfill
3378 Hennesey Road
Watervliet, MI 49098

Gentlemen:

Please find enclosed an MSD sheet for Mobil DTE 13 hydraulic oil. Due to a broken pump casing, about 400 gallons of this material ran into our asphalt parking lot. The oil was captured by spreading wood fines, a Type III waste, over the oil. In addition to the wood fines, 12 bags of oil dry were used to clean out the pumphouse. The oil dry was placed into two fiber drums which was then loaded into a Michigan Disposal dumpster along with the oil soaked wood fines. There is a total of 30 yards of this material. This is of a non-hazardous nature.

If you have any questions, please contact the writer or John Bonham.

Sincerely,

Otsego Paperboard Division

Keith B. Kling

Keith B. Kling
Environmental Supervisor

cc; John Bonham
Len Myers
Jay Thiessen

KBK:amc

Otsego Mill
320 N Farmer St
PO Box 155
Otsego MI 49078-0155
1-616-692-6141

DRAFT

April 11, 1991

Mr. Keith Kling
Menasha Corporation
320 North Farmer Street
Otsego, Michigan 49078

RE: Results of Aquifer Analysis, Hydraulic Oil Remediation, East Truck Dumper, Otsego Paperboard Plant - STS Project No. 1183-XF

Dear Mr. Kling:

As you are aware, aquifer analysis was performed in conjunction with the installation of a purge well for the above referenced project. This project was performed as a follow-up service for the design and installation of the East Truck Dumper remediation system. This work was completed under Menasha's purchase order no. 483826.

STS apologizes for the delay in forwarding this data. If you have any questions, please contact me at (517) 321-4964.

Sincerely,

STS CONSULTANTS, LTD.

Anne M. Murray
Project Hydrogeologist

Bernard B. Sheff, P.E.
Principal Engineer
Regional Office Manager

AMM/lch BBS 29-35

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
517.321.4964/Fax 517 321 2132

Report

MEN01866

PROJECT

Results of Aquifer Analysis
Hydraulic Oil Remediation, East Truck Dumper
Otsego Paperboard Plant

CLIENT

Menasha Corporation
320 North Farmer Street
Otsego, Michigan 49078

DRAFT

Project No.

1183-XF

Date

April 11, 1991

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
517.321.4964 / Fax 517.321.2132

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FIGURES

APPENDIX

MEN01868

DRAFT

AQUIFER ANALYSIS RESULTS
HYDRAULIC OIL REMEDIATION, EAST TRUCK DUMPER
OTSEGO PAPERBOARD PLANT

1.0 PROJECT OVERVIEW

Previous studies at the East Truck Dumper at the Otsego Paperboard Plant had indicated contamination from hydraulic oil in soil and groundwater (References 1 and 2). In January of 1989, after the discovery of hydraulic oil in monitoring well MW-1 (Reference 1), an 8-inch well was installed to recover and control any hydraulic oil release in groundwater at the truck dumper. Purge well, PW-1 was installed approximately 8 feet down-gradient of MW-1, utilizing cable tool drilling techniques (Figure 1). Due to the presence of a sandy clay layer approximately 5 feet below the groundwater surface, the well screen was installed at the clay layer to collect oil contamination above the clay lens. The well was developed by over-pumping, and a pumping rate of approximately 0.5 gallons per minute (gpm) after development was recorded.

Regarding the soil contamination, a subsurface irrigation system was installed to purge the hydraulic oil from the unsaturated zone in Fall, 1989 (Figure 2). As this irrigation system would add substantially more water to the groundwater system, a long-term pumping test was to be performed to evaluate hydraulic control at the site. In general, it is proposed that the existing groundwater flow direction, indicated on Figure 2, will be impacted locally after implementation of the pump system. In addition, the zone of capture created by the purge system should not be charged by the implementation of the irrigation system. Therefore, to provide additional information concerning the permeability of the aquifer, and impacts to the static water table, STS performed a pump test and single well conductivity testing of the purge well PW-1 and monitor well MW-102. The results of the pump test, conductivity testing and the evaluation of that data are included in the following report.

Insert Figure 1 here

Insert Figure 2 here

2.0 SCOPE OF WORK

On May 15, 1989, a QED pulse pump was installed in the purge well. Prior to pumping, water levels were recorded in monitoring wells MW-101, MW-102, MW-103, and in purge well PW-1 (Figure 1). During the initial two weeks, difficulties with setting the pump limited the dependability of the data and therefore, a new pump test data was required. In late May, a data logger transducer was installed in MW-102, as the presence of free product in MW-1 limited the use of the transducer in this well. As a further complicating factor, on May 31, 1989, approximately four inches of rain was recorded in the area, affecting substantial water level increase, particularly in MW-102, which is suspected to have been exposed to surficial runoff due to the transducer installed within the well. As an aside, the rain event impacted the transport of oil to the purge well as visible product was seen in the discharge after the rain event.

As stated above, the long-term pump testing of PW-1 proved a difficult task, yielding questionable data. Therefore, to provide a supplement to this data, single well hydraulic conductivity tests or "slug" tests, were performed in MW-102 and PW-1. These data were used to estimate permeability of the aquifer on a near-field basis as opposed to the pump test which evaluates the entire aquifer surrounding well.

Finally, the scope of work included the evaluation of the pump test data, permeability data, and previous geologic and site hydrogeology data in developing a capture zone for the recovery well. As part of this evaluation, the impact of the irrigation system would be evaluated.

3.0 RESULTS AND LONG-TERM REMEDIATION

3.1 Results

Due to difficulties in the use of the data logger for recording water levels in MW-102, including the introduction of surface water, only limited pieces of pump test data were available for analysis. Therefore, to estimate the permeability of the aquifer utilized what data was available, a Theis non-equilibrium type fit curve was utilized with data collected from MW-1 for the original pumping from the purge well. This data represented approximately 1.5 hours. The analysis of the Theis match are presented in the Appendix. In general, the results indicate a local permeability of 10.31 gpd/ft² or 4.89×10^{-4} cm/sec. with a storativity of .024.

To provide validity for these permeabilities, single well conductivity tests were performed on October, 1989. This data was analyzed by the Horslev method to estimate hydraulic conductivity. The analysis of the rising well test for MW-102 permeability is 7.2×10^{-3} cm/sec. or 153 .4 gpd/ft². The analysis for PW-1 is 4.5×10^{-4} cm/sec. or 9.8 gpd/ft². If is important to note that the sands encountered at MW-102 are generally coarser with lesser amounts of silt than the soils at MW-1 or PW-1. The permeability results tend to verify these textural differences. Furthermore, the results of the slug test and pump testing of PW-1 appear to match closely.

These permeability results were utilized to estimate a capture zone for the purge well PW-1. In general, the capture zone is estimated using a method developed by superposition utilizing the groundwater gradient, permeability, aquifer thickness, and pumping rate. Using a pumping rate of 0.5 gpm, a groundwater gradient from Figure 2 of 0.02, an estimated aquifer thickness of 5 feet, and a hydraulic conductivity of 10 gpd/ft, the capture zone will extend approximately 114 feet downgradient of PW-1, as shown on Figure 3. This estimate assumes that the clay lens is continuous for this distance. It also assumes the hydraulic conductivity of the soil is isotropic. However, as shown by the slug test of MW-102, the potential for a higher hydraulic conductivity exists. To provide a conservative estimate of permeability, the three permeabilities were averaged to a value of 57.3 gpd/ft².

This capture zone is also presented in Figure 3. This capture zone would not encompass the entire area upgradient in which the irrigation system has been installed.

As seen from Figure 3, the capture zone calculated utilizing the higher hydraulic conductivity from MW-102 for the entire aquifer decreases the effective capture zone and would not appear to show capture at MW-2. It should be noted, however, that the distinct soil differences were indicated between the sands at MW-102 and at the pumping well and at MW-1. Secondly, the clay layer on which MW-1 was placed, rises substantially to the south and west. Specifically, previous studies was shown that less than 40 feet south of PW-1, the clay surface rises above the water table and PW-103 only has 1-½ to 2 feet of water above the clay layer.

In summary, the reduction in aquifer thickness to the south and west violates the calculation assumptions of infinitely thick large aquifer of 5 feet saturated thickness. By restricting the amount of water which can be drawn to the south and west of the monitoring well, the capture zone would then be increased in the direction upgradient and away from the well. Therefore, the capture zone calculated based on model of the lower permeability from PW-1 represents a more realistic probable in-field conditions. Or in other words, the actual capture zone would encompass MW-2.

Finally, increased vertical seepage, on the order of a ½-gallon per square foot of irrigation bed per day added to the unsaturated zone, will effectively transport the trapped oil to the water table. The capture zone to be created by PW-1 should collect the vertical flow as it meets the water table for transport to the surface and treatment. Specifically, the addition of infiltration water from the irrigation system will allow the purge well system to develop more drawdown and effectively create a thicker aquifer to pump from near-field to the purge well. Since the pump was sized to operate at higher flows, the cone of depression should not change after the irrigation is started.

Insert Figure 3 here

3.2 Long-Term Remediation

Regarding the purge water from PW-1, previous discussion with Menasha Corporation has indicated that treatment in the existing plan white water system is feasible.

Once the purge water is transferred to the surface, a pump system will be required to transport the water to the treatment system. A wetwell arrangement located above or below ground (within a building, if above-ground) should be utilized. Since a daily flow of between 2,000 and 2,500 gallons per day is expected, a holding tank/wetwell with a volume of 200 to 250 gallons would be recommended. This would allow discharge ten times per day into the white water system. The holding tank should be top-loading and equipped with a bottom discharge such that oil skimming, if necessary, could be performed.

As the hydraulic oil which has been released is quite viscous and slow-moving, the time required for treatment is not known. As shown by the rainfall event of May, 1989, the vertical flow is required to strip the oil from the soil. Only close monitoring of the effluent will show when reasonable remediation has been completed. In addition, a confirmatory soil boring will be required after the remediation as reached the asymptotic point where oil concentrations stop decreasing.

Finally, in order to operate the irrigation system, a groundwater discharge permit will be required. This permit is obtained from the MDNR per Part 22 of Act 245, the Water Resources Conversion Act.

4.0 RECOMMENDATIONS

Hydraulic oil contamination was identified in the soils and groundwater at Truck Dumper No. 2 at the Menasha Otsego Paperboard Plant in early 1986. Studies performed at the site since that time have indicated that a small clay lens exists below Truck Dumper No. 2. This lens appears to limit the hydraulic oil seepage and perch the water table in this vicinity. The purpose of this study was to evaluate the aquifer properties (permeability) using the pumping well installed in January of 1989. Due to difficulties with data collection, additional single well conductivity tests were performed in order to supplement pump test data. Finally, the aquifer data was used to evaluate the aquifer in the area with regard to soil and groundwater remediation.

In general, the results of this study in conjunction with the presence of the clay layer indicate that the pumping well installed in January of 1989 is sufficient and will affect a significantly wide capture area to control the hydraulic oil contamination. Furthermore, artificially induced seepage from a subsurface irrigation system installed below the truck dumper will also be collected in this system. This subsurface irrigation system will act to remediate the vadose zone soils below the truck dumper.

STS recommends that the groundwater purge system be initiated as soon as possible. In addition, nearby groundwater wells should be monitored for water quality and water level fluctuations. A permanent discharge system, as described in this report, should be set up to handle transfer the purge water from the well.

Finally, STS recommends that Menasha pursue a groundwater discharge permit from Michigan Department of Natural Resources under Part 22 of Act 245 the Water Resources Commission Act. When the groundwater discharge permit has been secured, the subsurface irrigation system could be utilized to create a cleansing system in the vadose zone below the truck dumper. As the purge system would already be in place and at steady state condition, the effects of the irrigation system could be accurately assessed.

5.0 GENERAL QUALIFICATIONS

STS Consultants, Ltd. was retained by the Menasha Corporation to evaluate the purge well control for the hydraulic oil remediation at the site. The information was obtained from the field exploration performed by STS.

The conclusions of this report are based on data which is presented in the report. Data was collected for the purposes outlined in this report, and should not be used for reasons other than those intended. No other warranty of any kind, expressed or implied, at common law or created by statute, is extended, made, or intended by the rendition of consulting services or by furnishing oral or written reports of the findings made.

MEN01878

REFERENCES

1. Otsego Paperboard Plant: Site Contamination Survey and Remediation Study -- Final Report -- Menasha Corporation; STS Consultants, Ltd. Project No. 1123-XF, August 1, 1988.

2. Addendum to Otsego Paperboard Plant Final Report -- Results of Additional Hydraulic Oil Contamination Survey -- STS Consultants, Ltd. Project No. 1123-XF, June 23, 1989.

F.U. #2 TD

Memo

MEN01879

PAPERBOARD DIVISION

MENASHA CORPORATION

TO: Jay Thiessen

DATE: May 13, 1992

SUBJECT: Recent Oil Related Environmental Problem of #2 Truck Dumper

FROM: Phil Allen PJA.

Due to policy preference and the recent hydraulic oil leak and spill problems in the woodyard we recommend the following changes.

1. We will redesign the oil drum dump containment area to be properly designed and constructed with walls on four sides. Would you please have the operator keep it clean daily. The material now is plugging the drain.

2. When leaks are detected through the shift production checklist inspection have the operator immediately contain them and call the tour millwright for immediate repair. If the tour millwright cannot repair them, call the maintenance supervisor or myself.

3. When a leak is detected we desire to shut the unit down as soon as repair people are staged to facilitate the repair.

4. As always it would assist us if the shift operational people could write the work orders to request the repairs.

5. We will redesign the hydraulic room containment area to be properly designed so leaks cannot escape between the wall and the interior containment wall.

6. We will redesign and reinstall the hydraulic piping to proper design and installation. The pipe should have been and will be welded construction, retained properly and located within the containment area of the room.

7. Would you please have the operator clean the floor drain of hydraulic room. Now it is full of oil dry and limits the volume the drain can handle and the oil dry could plug the drain completely and overflow the containment area.

Your assistance in helping us strictly adhering to these changes will be greatly appreciated.

cc J. Bonham P. Jachim
J. Porter Maintenance Staff

FORM 561.4 REV. 11/91

MEN01880

SOIL CONTAMINATION ON SOUTH SIDE OF MILL

DOCUMENT #43

MEN01881

MENASHA CORPORATION
PAPERBOARD GROUP

June 18, 1986

Mr. Steve Batts
Orchard Hills Sanitary Landfill
3378 Hennessy
Watervliet, MI 49098

Dear Mr. Batts,

Menasha Corporation has identified materials from three locations on our mill site that need to be disposed of. We have received the results of the EP toxicity test on the first site, which indicate that it is a Class II non-hazardous waste. This material is mainly soil with amounts of a tar or asphaltlike substance intermixed. We estimate approximately 2,000 yards of this soil will need to be disposed of. We would like to begin hauling this material to your landfill immediately. Test results for the other two sites will be back shortly, and if these meet our expectations of being nonhazardous, we will contact you at a later date about their disposal.

Sincerely,

MENASHA CORPORATION

John T. Bonham
Technical Manager

m

FORM 561

MEN01882

memo / CORPORATION

TO: Memo to File

DATE: June 25, 1986

SUBJECT:

FROM: JTB John Bonham

Results of EP Toxicity Testing on Soil Samples Taken June 12, 1986

Material	Site #1 top (mg/l)	Site #2 Isopar (mg/l)	Site #3 U-drain (mg/l)	Site #4 Top Block (mg/l)	Hazardous Limit (mg/l)
Cyanide	<0.2	<0.2	<0.2	<0.2	20
Chromium	0.2	Non-Det	0.1	0.24	5
Silver	0.08	0.05	0.08	0.06	5
Zinc	0.70	1.1	0.94	1.0	500
Lead	Non-Det	0.2	2.0	0.24	5
Copper	<0.01	0.01	0.01	0.01	100
Cadmium	0.04	0.01	0.04	0.04	1
Barium	Non-Det	0.4	0.25	0.4	100
Mercury	Non-Det	Non-Det	Non-Det	Non-Det	0.2
Selenium	Non-Det	Non-Det	Non-Det	Non-Det	1
Arsenic	Non-Det	Non-Det	Non-Det	Non-Det	5
Flash Point (Degrees F)	>200	>200	>200	>200	140

There were no peaks that matched the EP 601 and 602 scans for purgeable halocarbons. Testing for PCB's was also negative on all 4 samples.

Testing performed by Prien & Newhof in Grand Rapids, MI.

kj

MEN01883

MENASHA CORPORATION
PAPERBOARD GROUP

June 27, 1986

Steve Batts
Orchard Hills Sanitary Landfill
3378 Hennessey
Watervliet, MI 49098

Dear Steve,

Please find attached the results of our testing on the material we would like to place in the Orchard Hills Class II Landfill. We would like to use your landfill for material from the sites labeled #2 and #3. This material is primarily dirt with some amounts of the following substances mixed in: asphalt, asphalt covered paper, Isopar, and industrial-type oils. The test results indicate that this material is clearly non-hazardous. We have approximately 1000 yards to dispose of, and we would very much appreciate your quick consideration of this request.

If you have any questions or require any further information, please call me.

Sincerely,

Menasha Corporation
Otsego Paperboard Division

John T. Bonham
Technical Manager

cc: John Blauwkamp
Sandra Jones

kj

MEN01884

KALAMAZOO COUNTY GOVERNMENT

HUMAN SERVICES DEPARTMENT
Public Health Division

418 WEST KALAMAZOO AVENUE•KALAMAZOO, MICHIGAN 49007
PHONE (616) 383-8888

June 30, 1986

John T. Bonham
Menasha Corporation
Otsego Paperboard Division
Box 155, 320 N. Farmer Street
Otsego, Michigan 49078

Dear Mr. Bonham:

Based on the leachate test done by Prien & Newhof on the material at the sites labeled #1 & 4, we see no reason why it couldn't be deposited at the Cork Street Type III Landfill.

I will send a copy of the letter to Michigan Disposal so they will accept this approximately 5,000 cu. yards of material.

Written under the direction of James E. Akers, Environmental Services Director.

Sincerely,

Fred D. Weaver

Fred D. Weaver, R.S.
Assistant Director
Environmental Services

FDW:rd
cc: Michigan Disposal

MEN01885

MENASHA CORPORATION
PAPERBOARD GROUP

July 11, 1986

Sue Schweikart
Department of Natural Resources
Compliance Section
621 10th St.
Plainwell, MI 49080

Dear Sue:

Enclosed are the results of the ASTM Water Shake Leachate test performed on a composite sample of the soil we wish to place in the Type III Cork Street Landfill in Kalamazoo. Per our previous conversations, the MDNR would not object to this approach providing the results of the leachate test showed that the sample did not exceed EPA drinking water standards on any one item by more than 3 times the allowable concentration. The attached test results clearly show us to be within this limit. Per your request, we also reran the EP 601 and 602 scans, and the EP Toxicity Leachate test, with results attached.

We would appreciate a quick notification to the Kalamazoo Human Services Department, Public Health Division that you have no objections to us depositing this material in the Cork Street landfill. If there are any questions or comments, please call me.

Sincerely,

John T. Bonham
Technical Manager

cc: Fred D. Weaver, R.S.
Human Services Dept., Public Health Div.
418 W. Kalamazoo Ave.
Kalamazoo, MI 49001

kj

MEN01886

PREIN & NEWHOF, P.C.
ENGINEERS — SURVEYORS
ENVIRONMENTAL & SOILS LABORATORIES
3000 EAST BELT LINE N E , GRAND RAPIDS, MICHIGAN 49505
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July 9, 1986
77129

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JAMES A COOK PE
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ROBERT J REIMINK PE
RICHARD L SERBOWICZ PE
ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "COMP PILE", received 6/30/86, Lab Log #897

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.02
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
EP Toxicity Leachate Results:	
Final pH	5.2
Arsenic, mg/L	0.002
Barium, mg/L	0.3
Cadmium, mg/L	0.081
Chromium, mg/L	<0.03
Copper, mg/L	0.07
Lead, mg/L	0.07

MEN01887

Menasha Corporation
July 9, 1986
Page 2

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	<0.01
Zinc, mg/L	0.790

ASTM Water Shake Leachate Results:

Final pH	8.0
Arsenic, mg/L	0.001
Berium, mg/L	0.4
Cadmium, mg/L	0.019
Chromium, mg/L	<0.03
Copper, mg/L	<0.02
Lead, mg/L	<0.03
Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	<0.01
Zinc, mg/L	0.031

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #897

MEN01888

PREIN & NEWHOF, P.C.
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ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "U Drain", received 6/13/86, Lab Log #780

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.2
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
PCB, mg/kg	<0.1
Flash Point, closed cup method	>200°F
EP Toxicity Leachate Results:	
Final pH	4.8
Arsenic, mg/L	<0.01
Barium, mg/L	0.3
Cadmium, mg/L	0.040
Chromium, mg/L	0.10
Copper, mg/L	<0.02
Lead, mg/L	2.00

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.01
Silver, mg/L	0.08
Zinc, mg/L	0.94

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #780

MEN01890

PREIN & NEWHOF, P.C.
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REX A MILLIRON R L S

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "ISOPAR", received 6/13/86, Lab Log #779

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.2
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
PCB, mg/kg	<0.1
Flash Point, closed cup method	>200° F
EP Toxicity Leachate Results:	
Final pH	4.8
Arsenic, mg/L	<0.01
Barium, mg/L	0.4
Cadmium, mg/L	0.010
Chromium, mg/L	<0.03
Copper, mg/L	<0.02
Lead, mg/L	0.20

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.01
Silver, mg/L	0.05
Zinc, mg/L	1.10

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #779

PREIN & NEWHOF, P.C.
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July 9, 1986
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REX A MILLIRON R L S

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "TOP BLACK", received 6/13/86, Lab Log #784

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.2
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
PCB, mg/kg	<0.1
EP Toxicity Leachate Results:	
Final pH	5.0
Arsenic, mg/L	<0.01
Barium, mg/L	0.4
Cadmium, mg/L	0.040
Chromium, mg/L	0.24
Copper, mg/L	<0.02
Lead, mg/L	0.24

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.01
Silver, mg/L	0.06
Zinc, mg/L	1.00

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #784

MEN01894

PREIN & NEWHOF, P.C.
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REX A MILLIRON R L S

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "TOP", received 6/13/86, Lab Log #778
where barrels were stored

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.2
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
PCB, mg/kg	<0.1
Flash Point, closed cup method	>200°F
EP Toxicity Leachate Results:	
Final pH	4.8
Arsenic, mg/L	<0.01
Barium, mg/L	<0.2
Cadmium, mg/L	0.040
Chromium, mg/L	0.20
Copper, mg/L	<0.02
Lead, mg/L	<0.03

MEN01895

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.01
Silver, mg/L	0.08
Zinc, mg/L	0.70

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #778

MEN01896

PREIN & NEWHOF, P.C.
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REX A MILLIRON R L S

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "NORTH ISOPAR", Lower Section received 7/2/86,
Lab Log #938 Bottom of excavation

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.02
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
EP Toxicity Leachate Results:	
Final pH	4.9
Arsenic, mg/L	0.006
Barium, mg/L	0.9
Cadmium, mg/L	0.021
Chromium, mg/L	0.06
Copper, mg/L	0.06
Lead, mg/L	<0.03

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	0.004
Selenium, mg/L	<0.005
Silver, mg/L	0.02
Zinc, mg/L	0.136

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #938

MEN01898

PREIN & NEWHOF, P.C.
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ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "SOUTH ISOPAR", Lower Section, received 7/2/86,
Lab Log #939 Bottom of excavation

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.02
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
EP Toxicity Leachate Results:	
Final pH	4.9
Arsenic, mg/L	0.020
Barium, mg/L	1.0
Cadmium, mg/L	<0.005
Chromium, mg/L	<0.03
Copper, mg/L	0.05
Lead, mg/L	<0.03

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	0.001
Selenium, mg/L	<0.005
Silver, mg/L	0.02
Zinc, mg/L	0.092

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #939

MEN01900

PREIN & NEWHOF, P.C.
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July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "COMP PILE", received 6/30/86, Lab Log #897
Excavated from under slab

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.02
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
EP Toxicity Leachate Results:	
Final pH	5.2
Arsenic, mg/L	0.002
Barium, mg/L	0.3
Cadmium, mg/L	0.081
Chromium, mg/L	<0.03
Copper, mg/L	0.07
Lead, mg/L	0.07

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	<0.01
Zinc, mg/L	0.790

ASTM Water Shake Leachate Results:

Final pH	8.0
Arsenic, mg/L	0.001
Berium, mg/L	0.4
Cadmium, mg/L	0.019
Chromium, mg/L	<0.03
Copper, mg/L	<0.02
Lead, mg/L	<0.03
Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	<0.01
Zinc, mg/L	0.031

PREIN & NEWHOF
Jane Hoch
Jane Hoch
Chemist

P&N Lab Log #897

MEN01902

PREIN & NEWHOF, P.C.
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TELEPHONE (616) 399-9218

July 9, 1986
77129

Menasha Corporation
P.O. Box 155
Ostego, Michigan 49078

Attn: Mr. Mark Reed

Re: Soil Sample "SW PILE", received 6/30/86, Lab Log #898

ran from one area
of slab pile

LABORATORY RESULTS

Total Cyanide, mg/kg sample	<0.2
Volatile Halocarbon Scan, mg/kg	<1
Volatile Aromatic Hydrocarbon scan, mg/kg	<1
EP Toxicity Leachate Results:	
Final pH	4.9
Arsenic, mg/L	0.001
Barium, mg/L	<0.1
Cadmium, mg/L	0.012
Chromium, mg/L	<0.03
Copper, mg/L	0.09
Lead, mg/L	<0.03

EP Toxicity Leachate Results, Cont'd

Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	<0.01
Zinc, mg/L	0.461

ASTM Water Shake Leachate Results:

Final pH	8.2
Arsenic, mg/L	0.011
Barium, mg/L	0.8
Cadmium, mg/L	0.068
Chromium, mg/L	<0.03
Copper, mg/L	0.13
Lead, mg/L	0.14
Mercury, mg/L	<0.001
Selenium, mg/L	<0.005
Silver, mg/L	0.06
Zinc, mg/L	0.238

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

P&N Lab Log #898

PREIN & NEWHOF, P.C.
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ROBERT J REIMINK P E
ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

July 10, 1986
77129

Mr. Mark Reed
Menasha Corporation
P. O. Box 155
Otsego, Michigan 49078

Dear Mr. Reed:

Enclosed are the laboratory results of tests performed on various soil samples delivered to our laboratory between June 13 and July 2, 1986.

The following methods were used for the various tests:

Total Cyanide: EPA 335.2 (digestion, colorimetric)

Volatile Halocarbons and Volatile Aromatic Hydrocarbons: Extraction by EPA 5030 and Scans by EPA 601 and 602

PCBs: Subcontracted to Kar Laboratories, Kalamazoo, MI
EPA Method 8080 with Sonicaton Extracton method 3550

Flash Point: Subcontracted to AAT Laboratory, Grand Rapids, MI
Closed Cup Method

EP Toxicity Leachate Preparation: EPA 1310

ASTM Water Shake Leachate Preparation: ASTM Method #D3687-1

Total Arsenic: EPA 206.3 (hydride, AA)

Total Barium: EPA 208.1 (direct aspiration AA)

Total Cadmium: EPA 213.1 (direct aspiration AA)

Total Chromium: EPA 218.1 (direct aspiration AA)

Total Copper: EPA 220.1 (direct aspiration AA)

Total Lead: EPA 239.1 (direct aspiration AA)

MEN01905

Mr. Mark Reed, Menasha Corporation
July 10, 1986
Page 2

Total Mercury: EPA 245.1 (cold vapor, manual)

Total Selenium: EPA 270.3 (hydride AA)

Total Silver: EPA 272.1 (direct aspiration AA)

Total Zinc: EPA 289.1 (direct aspiration AA)

The Volatile Halocarbons and Volatile Aromatic Hydrocarbons looked for and detectable on EPA scans 601 and 602 are listed below:

Methylene Chloride	Chlorodibromomethane
Trichlorofluoromethane	Benzene
1,1-Dichloroethylene	2-chloroethyl vinyl ether
1,1-Dichloroethane	Bromoform
trans-1,2-Dichloroethylene	1,1,2,2-Tetrachloroethane
Chloroform	Tetrachloroethylene
Carbon tetrachloride	Toluene
1,2-Dichloroethane	Chlorobenzene
1,1,1-Trichloroethane	Ethylbenzene
Bromodichloromethane	m-xylene
1,2-Dichloropropane	p-xylene
trans-1,3-dichloropropene	o-xylene
Trichloroethylene	1,2-dichlorobenzene
1,1,2-Trichloroethane	1,3-dichlorobenzene
cis-1,3-dichloropropene	1,4-dichlorobenzene

The PCBs lookedfor and detectable by the method used are :

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

If you have any questions, please do not hesitate to call me or Bob Erickson at (616) 364-8491.

Very truly yours,

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

JH:j

MEN01906

PREIN & NEWHOF, P.C.
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ROBERT J REIMINK PE
RICHARD L SERBOWICZ PE
ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

September 17, 1986
77129

West of warehouse

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

RE: Garage Soil, 9/4 /86

LABORATORY RESULTS

I. EP Toxicity Leachate Concentrations

Final pH	5.2
Arsenic, mg/L	<0.002
Barium, mg/L	0.2
Cadmium, mg/L	0.021
Chromium, mg/L	<0.04
Copper, mg/L	<0.03
Lead, mg/L	<0.07
Mercury, mg/L	<0.0004
Selenium, mg/L	<0.001
Silver, mg/L	0.03
Zinc, mg/L	0.088

II. Total Cyanide, mg/kg <0.02

III. Volatile Organics Scans 601,602 None detected, <1 mg/kg

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

Lab Log #1386

MEN01907

PREIN & NEWHOF, P.C.
ENGINEERS — SURVEYORS
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3000 EAST BELT LINE N E , GRAND RAPIDS, MICHIGAN 49505
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TELEPHONE (616) 364-8491
TELEPHONE (616) 399-9218

September 17, 1986
77129

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

RE: Garage Water Sample 9/4/87

LABORATORY RESULTS

Volatile Organics Scans 601, 602	None Detected < 1 ug/L

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

Lab Log # 1385

JH:sa

MEN01908

PREIN & NEWHOF, P.C.
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MICHAEL S FULLER PE
PHILIP C GLUPKER PE
JAMES A COOK PE
ROBERT J VANDER MALE PE
ROBERT J REIMINK PE
RICHARD L SERBOWICZ PE
ARTHUR W BRINTNALL R L S
REX A MILLIRON R L S

November 28, 1986
77129

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

RE: Isopar Samples received 6/19/86 and 10/7/86

Dear Mr. Bonham:

Isopar samples #1 and #2, received October 7, 1986 were analyzed by Gas Chromotography for the presence of fuel contamination. Benzene, Toluene, Ethylbenzene and Xylene are indicator compounds found in gasoline and fuel. These were the substances looked for in the pure isopar, and two unknown samples of isopar.

Pure isopar was first chromatographed. Then samples #1 and #2 were analyzed. The enclosed copies of the chromograms show peaks at the retention times for Toluene, Ethylbenzene and Xylene in the two unknown samples. The pure isopar had one Xylene peak. The four standard compounds were mixed with the pure isopar and chromatographed.

I am also enclosing a chromatogram of gasoline for your reference.

You will note isopar #1 has more Toluene, Ethylbenzene and Xylenes than #2. Number 1 also has more compounds with higher molecular weights as seen further out on the chromatogram.

Summary of Results:

	Pure Isopar	Isopar #1	Isopar #2
Benzene	Not present	Not present	Not present
Toluene	Not present	Present	Present
Ethylbenzene	Not present	Present	Present
Xylene (2 peaks)	One peak seen	Two peaks present	Two peaks present

If you have any questions please contact me or Bob Erickson

Very truly yours,

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

Lab Log # 811, 1524, 1525

JH:sa

MEN01910

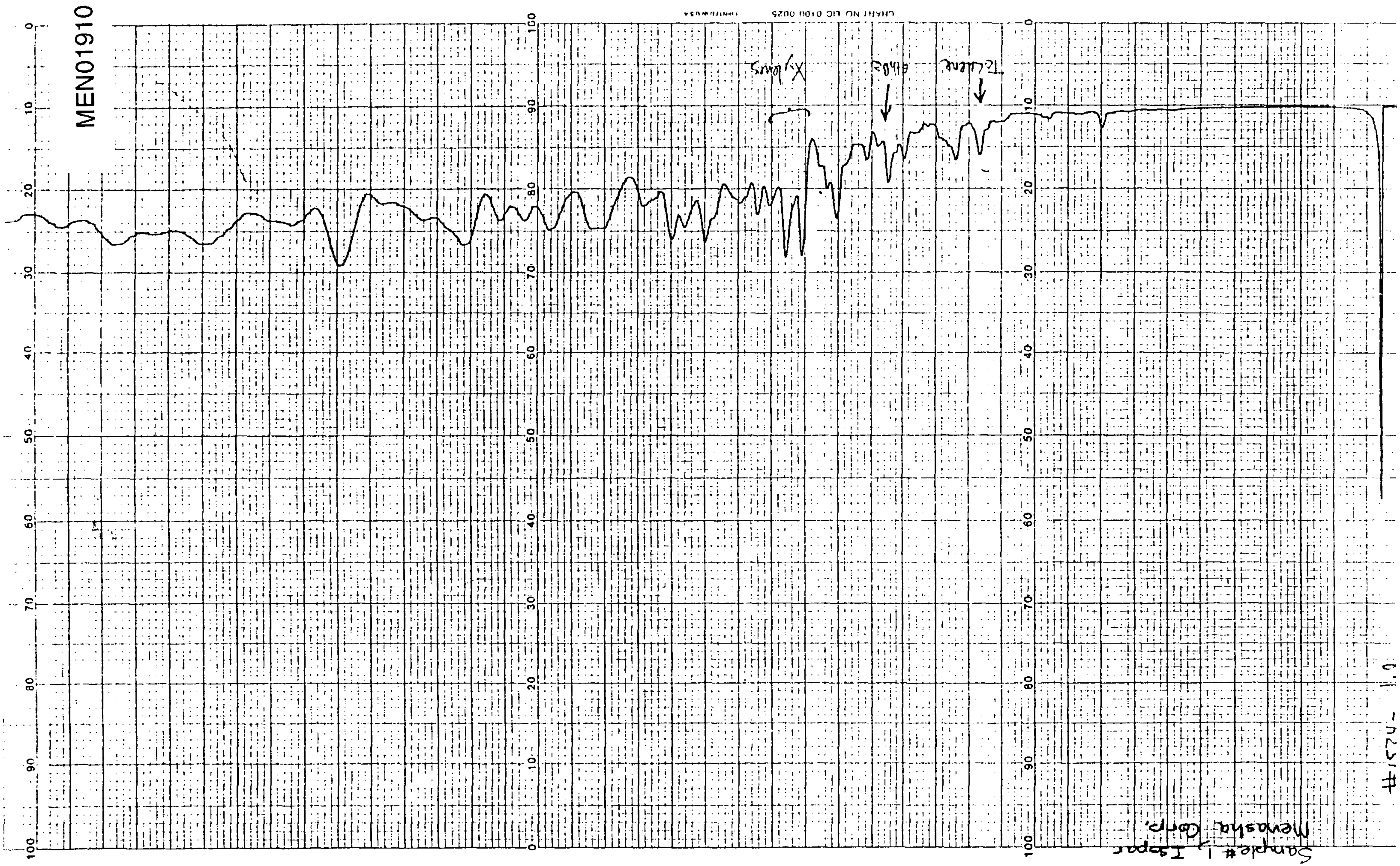
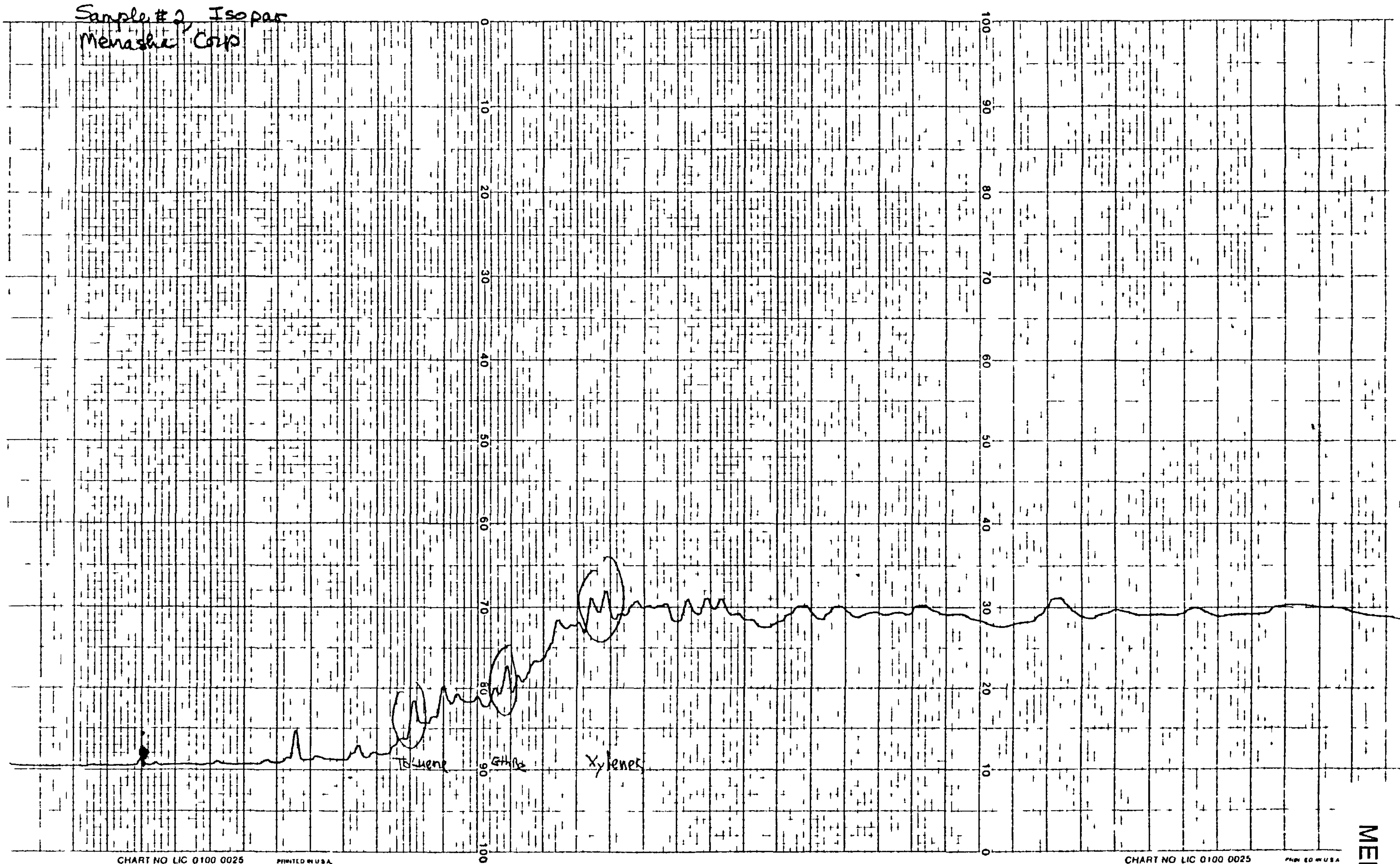


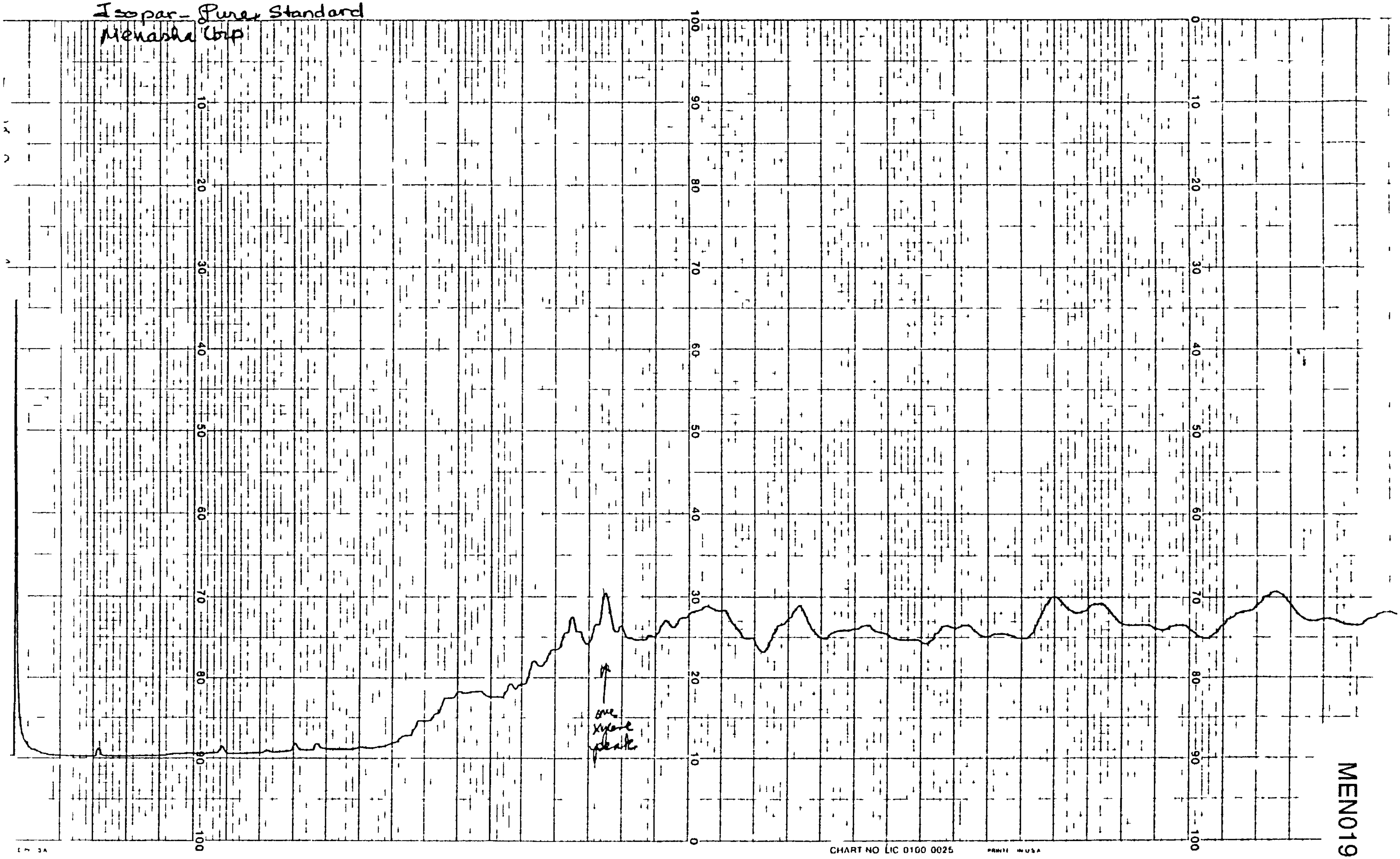
CHART NO LIC 0100 0025
Xylenes
Toluene
Sample # 1, Vapor
Menasha Corp.



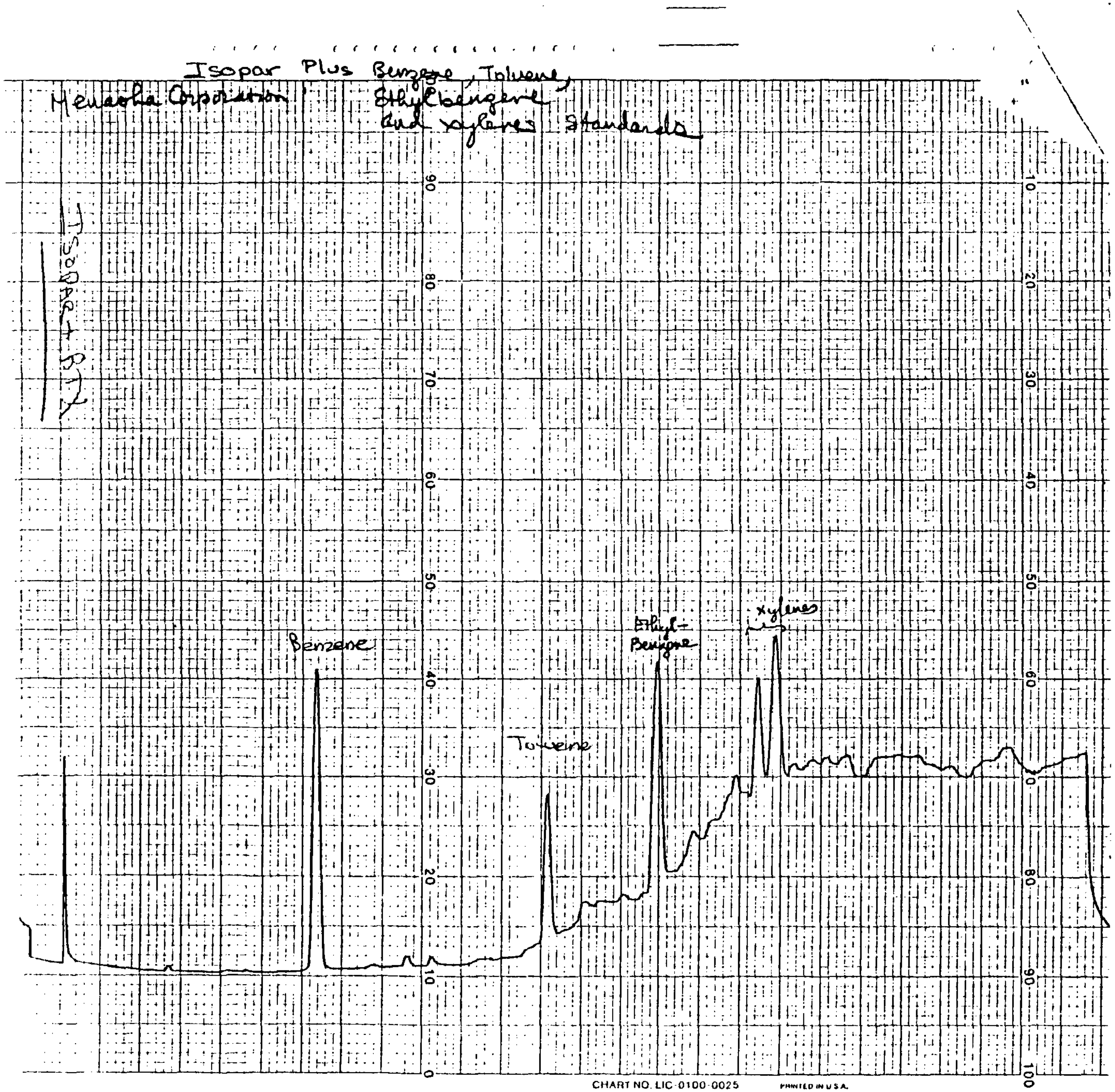
Sample #2, Isopar
Menasha Corp
Toluene
EtBz
Xylenes
CHART NO LIC 0100 0025
PRINTED IN U.S.A.
CHART NO LIC 0100 0025

MEN01911

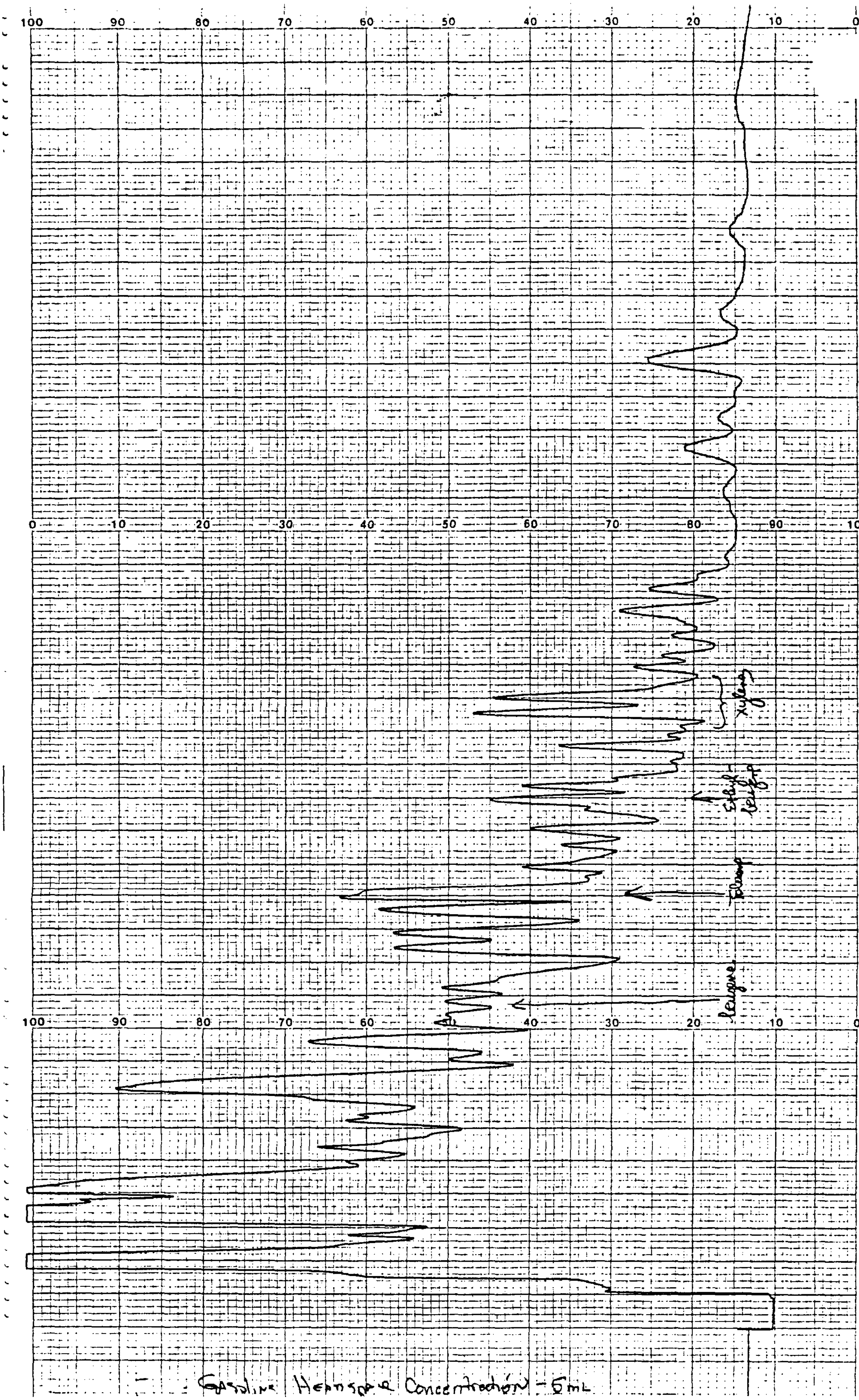
Isopar- Pure Standard
Menasha Corp



MEN01912


Isopar Plus Benzene, Toluene, Ethylbenzene and xylenes Standards
Menasha Corporation
ISOPAR + BTX
Benzene
Toluene
Ethyl-Benzene
xylenes
CHART NO. LIC-0100-0025
PRINTED IN U.S.A.

MEN01914



Gasoline Headspace Concentration - 5mL

MEN01915

KAR Laboratories, Inc.
4425 Manchester Road
Kalamazoo, MI 49002

(616) 381-9666

ANALYTICAL REPORT

To: Menasha Corporation

Date Received : 9- 8-86
Laboratory Code: 861075-2
Purchase Order # 4813781
Report Date : 9-17-86

Re: VOLATILE HYDROCARBON ANALYSIS MICHIGAN DNR Scan 1 and Scan 2

Sample Identification: Soil, Garage 2A

SCAN 1 Purgeable Halocarbons

	Result		Result
Bromoform	<10	trans-1,2-Dichloroethene	<10
Bromodichloromethane	<10	cis-1,2-Dichloroethene	<10
Dibromochloromethane	<10	1,1,1-Trichloroethane	<10
Chloroform	<10	1,1,2-Trichloroethane	<10
Carbon Tetrachloride	<10	Trichloroethene	<10
Methylene Chloride	<10	1,1,2,2-Tetrachloroethane	<10
1,1-Dichloroethane	<10	Tetrachloroethene	<10
1,2-Dichloroethane	<10	1,3-Dichloropropene	<10
1,1-Dichloroethene	<10	Chlorobenzene	<10

SCAN 2 Purgeable Aromatic Hydrocarbons

	Result		Result
Benzene	<10	Styrene	<10
Ethylbenzene	<10	Xylenes	<10
Toluene	<10		

Method: U.S. EPA Method 624 (GC-MS)

Petroleum hydrocarbons were detected but not quantified

Results are expressed as ug/L
< indicates not detected at the stated detection limit
--- indicates not analyzed

MEN01916

KAR Laboratories, Inc.
4425 Manchester Road
Kalamazoo, MI 49002

(616) 381-9666

ANALYTICAL REPORT

To: Menasha Corporation

Date Received : 9- 8-86
Laboratory Code: 861075-1
Purchase Order # 4813781
Report Date : 9-17-86

Re: VOLATILE HYDROCARBON ANALYSIS MICHIGAN DNR Scan 1 and Scan 2

Sample Identification: Pond Water, Garage 1A

SCAN 1 Purgeable Halocarbons

	Result		Result
Bromoform	<10	trans-1,2-Dichloroethene	<10
Bromodichloromethane	<10	cis-1,2-Dichloroethene	<10
Dibromochloromethane	<10	1,1,1-Trichloroethane	<10
Chloroform	<10	1,1,2-Trichloroethane	<10
Carbon Tetrachloride	<10	Trichloroethene	<10
Methylene Chloride	<10	1,1,2,2-Tetrachloroethane	<10
1,1-Dichloroethane	<10	Tetrachloroethene	<10
1,2-Dichloroethane	<10	1,3-Dichloropropene	<10
1,1-Dichloroethene	<10	Chlorobenzene	<10

SCAN 2 Purgeable Aromatic Hydrocarbons

	Result		Result
Benzene	<10	Styrene	<10
Ethylbenzene	<10	Xylenes	<10
Toluene	<10		

Method: U.S. EPA Method 624 (GC-MS)

Petroleum hydrocarbons were detected but not quantified

Results are expressed as ug/L
< indicates not detected at the stated detection limit
--- indicates not analyzed

FORM 501

Revised

MEN01917

memo / MENASHA CORPORATION

TO: File

DATE: September 9, 1986

SUBJECT: Soil Contamination West of Warehouse

FROM: John Bonham

On September 8, 1986, at approximately 2:50 PM, I spoke on the phone with Galen Kilmer of the Michigan Department of Natural Resources about the contamination problem discovered while excavating west of our warehouse. I had previously discussed the problem with Sue Schweikart on September 3. I outlined the problem to Galen as follows:

On September 3, we discovered an unknown source of VOC's in our soil west of our existing roll storage warehouse. On September 5, we used an H.Nu meter to determine the extent of the contamination. The soil contamination was found to start slightly above the water table (approximately 8 feet below nominal ground level), and extend roughly 4 feet below the water table on average. The contaminated zone runs approximately 55 feet north/south, and extends 40 feet west of the warehouse. The contamination zone runs underneath the warehouse building itself. Our best guess as to the source of the contamination is a machine which used to sit approximately where our warehouse is now, and was used about four decades ago. Analysis of the contaminant is not yet complete, but a guess at this time would be some form of fuel oil.
The maximum reading obtained by the H-Nu meter was about 15 ppm above background.

I explained to Galen that we could not excavate the soil under the warehouse. I further stated that if a purge well were to become necessary to contain the contamination from under the warehouse, we might prefer to install the well, but not excavate any material, even outside the warehouse, and let the well contain all of the contamination.

Galen said instead that he was not worried about the material still under the warehouse, since whatever had not moved by this time probably wouldn't. He further stated that we should excavate all the contaminated material we can reach and dispose of it properly, but not to worry about anything under the warehouse. Galen then stated that there will be no paperwork or reporting requirements from Menasha to the MDNR for this problem.

cc: B. Buchanan
J. Blauwkamp
S. Jones

kj

Report

Project

SOIL MONITORING
AT
MENASHA PAPERBOARD PLANT
OTSEGO, MICHIGAN

Client

MENASHA PAPER CORPORATION
320 NORTH FARMER STREET
P.O. BOX 155
OTSEGO, MICHIGAN 49078-0155

Project # 1083

Date FEBRUARY 18, 1987

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing Michigan 48906
(517) 321-4964

MEN01919

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

February 18, 1987

Mr. John Blauwkamp
Menasha Paper Corporation
320 North Farmer Street
P.O. Box 155
Otsego, MI 49078-0155

RE: Soil Monitoring at Menasha Paperboard Plant, Otsego, Michigan-
FINAL DRAFT

Dear Mr. Blauwkamp:

STS Consultants, Ltd. is pleased to submit a summary of investigation for soil contamination performed at Menasha's Paperboard Plant in Otsego, Michigan. This report describes the field testing procedures and presents test results for soil investigations performed under your purchase order, number 4812284.

Following is a brief discussion of tasks completed on this project to date:

1.0 Introduction

The Menasha Corporation owns and operates the Paperboard Plant located in Otsego, Michigan. Your office contacted STS in June of 1986 with concerns that possible soil contamination may exist in an area of proposed construction. Several fuel oil tanks and tanks containing Iso-Par, a cleaning solvent, had once been located in this area. Menasha personnel had indicated that surface contamination was present. STS was commissioned to provide soil testing services to determine the existence of organic compounds. STS was to cooperate with Menasha personnel and their excavating subcontractors, Engle Excavating.

2.0 Site Geology

The geologic setting of Menasha's Otsego site is the result of glacial deposition and the later reworking of these glacial deposits. The bedrock of this area consists of a lower Mississippian Age Coldwater shale. The top elevation of this bedrock unit varies between 500 and 550 feet above sea level. The bedrock is overlain by 200 to 250 feet of glacial material.

The Kalamazoo River has provided deposition and reworking of glacial and alluvial deposits. Sand, gravelly sand, and peat were encountered during excavation of test pits. These soils were generally overlain by miscellaneous fill consisting of brown to black sand and gravel containing varying amounts of cinders, bricks, concrete, asphalt, tar paper and other debris.

3.0 Field Testing

Soil testing for this project consisted of obtaining a grab soil sample and scanning the sample with a portable gas analyzer. A backhoe provided by Engle Excavating was utilized to remove overburden and obtain soil samples. Successive test locations and depth of excavation were determined by Menasha personnel in cooperation with STS after volatile organic vapor levels had been determined by STS using an HNU-Model 101 photo-ionization detector.

The HNU meter is a portable trace gas analyzer used to measure relative concentrations of various organic vapors. Meter readings from this detector can be interpreted to a level of 0.1 parts per million (ppm) or existing background readings, whichever is greater. Soil samples were placed in glass jars and agitated to create a head space for vapors above the soil. The tip of the photo-ionizer probe was then placed in this vapor space in the sample jar. This procedure enables a sample of vapor to be tested without interference from wind currents which may carry exhaust fumes from construction equipment.

The results of the photo-ionization scans are provided in Table 1, and test locations illustrated in Figures 1 and 2. Please note that test locations are approximate and depth of sample is referenced to the existing ground surface at the time of testing. Elevations given for samples taken at the warehouse area are referenced to the top of a newly constructed footing which was located along the west wall and given an arbitary elevation of 100.00 feet. Groundwater elevations on September 5, 1986, were estimated at 92.0 feet, located at the center of the new warehouse construction.

TABLE 1
RESULTS OF PHOTO-IONIZATION DETECTION

Test Pit Location	Sample Designation	Depth Below Ground Surface (ft)	HNU-PID** (PPM Above Ambient)
Oil Drain	1	1.0	30.2
Area West of	2	2.5	20.2
Previous Ramp	3	9.0	0.2
Tested 6/12/86	4	2.0	9.4
	5	5.0	12.4
	6	9.0	0.1
	7	3.0	1.1
	8	5.0	0.6
	9	7.0	0.0
	10	1.0	0.4
	11	7.0	0.0
	12	1.0	3.5
	13	3.0	74.6
	14	6.0	0.6
	15	5.5	8.3
	16	1.5	0.0
	17	5.0	0.0
	18	3.0	0.0
	19	3.5	0.0
	20	6.0	0.0
Upper Level	21	4.0	0.0
Area North of	22	10.0	0.0
Previous	23	4.0	0.0
Concrete Wall	24	10.0	0.0
Tested 6/12/86			
Iso-Par Area	25	1.0	18.7
East of	26	3.0	10.2
Previous Ramp	27	5.0	7.2
Tested 6/12/86	28*	8.0	9.6
(# 28 water			
sample)	29	6.0	0.4
	30	7.0	5.2
	31	7.0	9.7
	32	1.0	14.2
	33	5.0	0.0
	34	6.0	0.9
	35	8.0	1.0
Oil Barrels	36	1.5	0.0
Area West of	37	2.5	0.0
Weir #002	38	4.0	0.0
Tested 6/12/86	39	6.0	0.0

** Photo-Ionization Detection

Test Pit Location	Sample Designation	Depth Below Ground Surface (ft)	HNU-PID (PPM Above Ambient)
Iso-Par Area	40	0.0	8.0
East of	41	0.0	11.6
Previous Ramp	42	0.0	11.8
Tested 6/23/86	43	0.5	22.4
	44	2.0	26.8

Note: Demolition of Concrete Wall
and Ramp Structure on 6/23/86

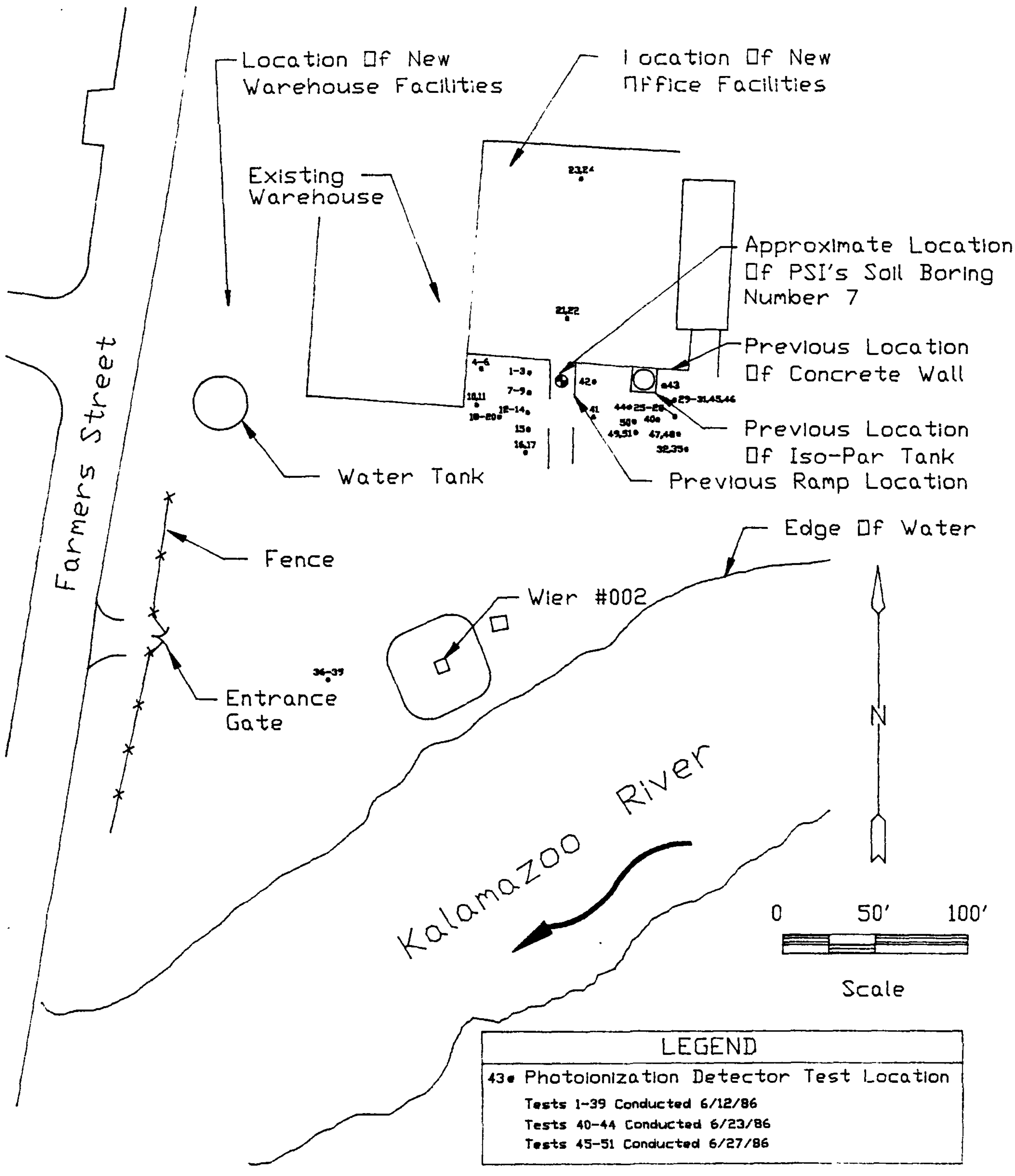
Test Pit Location	Sample Designation	Depth Below Ground Surface (ft)	HNU-PID (PPM Above Ambient)
Iso-Par Area	45	1.0	17.2
Tested 6/27/86	46*	3.0	8.3
	47	0.75	2.6
	48*	3.0	0.7
	49	2.5	0.6
	50*	3.0	19.7
	51*	3.0	3.3
Iso-Par Area	52*	Water Level (WL)	0.3
Tested 7/1/86	53*	WL	0.1
	54*	WL	0.0
(Water Sample)	55*	WL	0.0
	56	5.0	0.3
	57	1.7	4.6
	58	1.0	10.3
	59	3.0	19.3
	60*	3.7	20.3
	61*	3.0	9.4
(Water Sample)	62*	WL	18.8
	63*	3.7	1.2
	64*	3.7	4.4
	65	1.7	0.5
	66	3.0	0.5
	67*	3.4	1.4
	68	0.0	18.9
	69*	WL	7.8
	70	0.0	13.2
	71*	3.0	13.4
(Water Sample)	72*	WL	19.0
	73	1.5	0.0
	74	3.5	0.0
	75	4.5	0.0
	76	6.5	0.2
	77	8.5	0.0
(Water Sample)	78	8.5	0.0

* Grab sample obtained at Water Level

Test Pit Location	Sample Designation	Depth Below Ground Surface (ft)	HNU-PID (PPM Above Ambient)
		Elevation	
Warehouse Construction Area, Tested 9/5/86	79	92.0	0.8
	80	93.0	18.0
	81	93.5	6.4
	82	94.7	1.1
	83	92.0	0.0
	84	97.5	0.0
	85	92.0	0.0
	86	92.0	0.0
	87	92.0	13.5
	88	92.0	1.4
	89	90.5	0.5
	90	90.5	10.0
	91	89.0	8.7
	92	88.8	7.9
	93	88.0	11.0
	94	86.0	0.0
	95	92.0	14.3
	96	90.0	12.2
	97	90.0	1.9
	98	92.0	14.8
	99	92.0	5.8
	100	90.0	0.7
	101	90.0	0.1
	102	88.5	11.6
		Depth	
	103	1.0	4.6
	104	4.0	1.8
	105	0.75	0.0
	106	3.5	0.0
	107	5.0	0.0
	108	8.0	0.0
	109	8.5	0.0
	110*	9.0	0.0
		Elevation	
	111	100.0	0.0
	112	98.0	0.0
	113	96.0	0.0
	114	94.0	0.0
	115	92.5	0.0
	116	91.5	0.0
	117	91.7	0.0
	118	90.4	0.0

Note: Water Elevation = 92.0
* Grab Sample obtained at Water Level

MEN01925



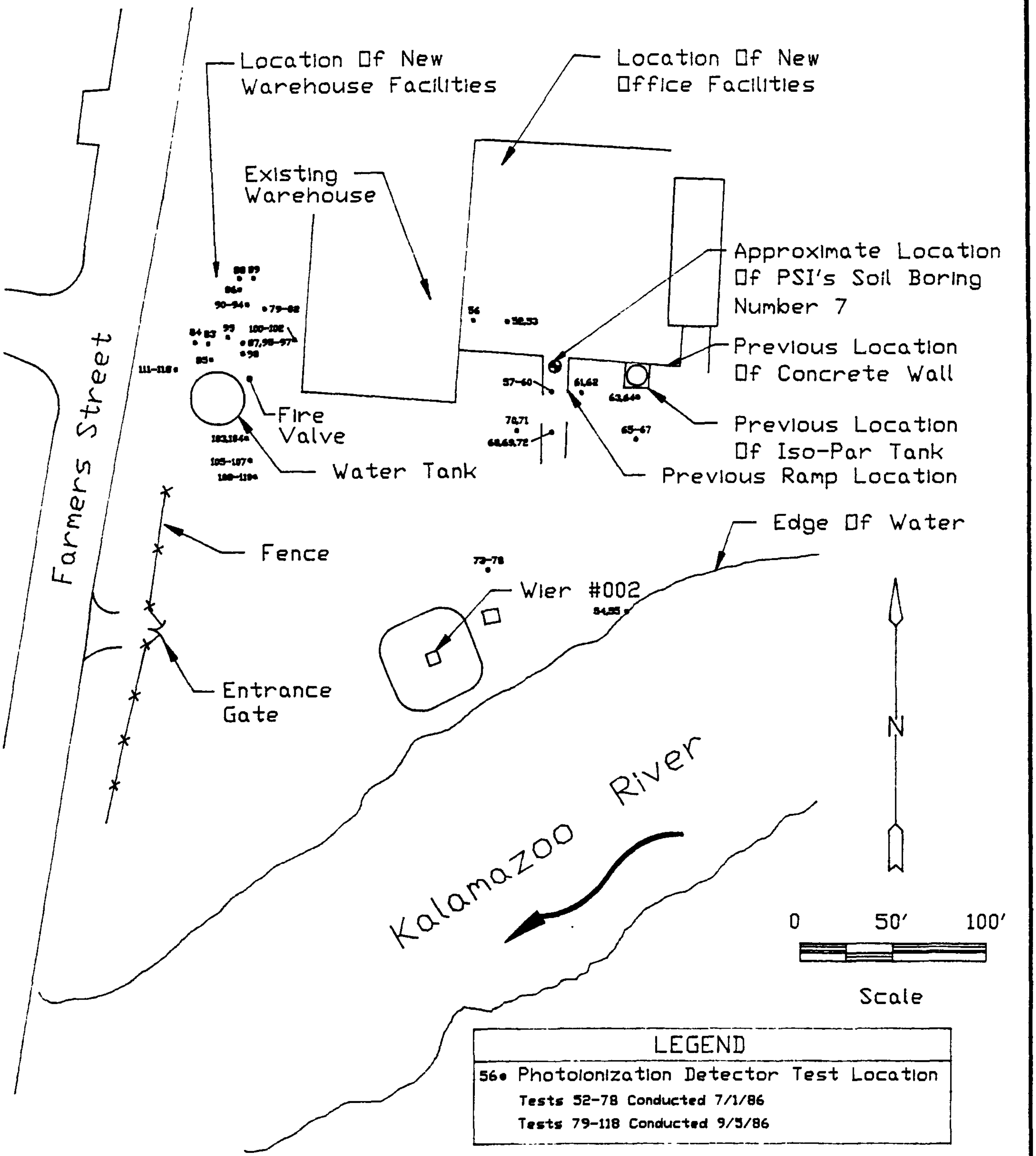
STS Consultants Ltd.
Consulting Engineers

PROJECT/CLIENT

SOIL MONITORING AT MENASHA PAPERBOARD PLANT
OTSEGO, MICHIGAN
MENASHA PAPER CORPORATION

DRAWN BY	DTH	12/86
CHECKED BY	MLY	12/86
APPROVED BY	WEH	12/86
SCALE As Shown	FIGURE NO. 1	
STS DRAWING NO. 1083		

MEN01926



STS Consultants Ltd.
Consulting Engineers

PROJECT/CLIENT

SOIL MONITORING AT MENASHA PAPERBOARD PLANT
OTSEGO, MICHIGAN
MENASHA PAPER CORPORATION

DRAWN BY	DTH	12/86
CHECKED BY	MLY	12/86
APPROVED BY	WEH	12/86
SCALE As Shown	FIGURE NO. 2	
STS DRAWING NO. 1083		

7881

4.0 Contamination Assessment

Soil samples were collected from excavated test pits and analyzed in the field with a photo-ionization detector (HNU meter). The results of the photo-ionization analysis has been presented on Table 1. These results present test locations, sample identification, and volatile organic vapor levels as measured with the photo-ionization detector.

Soil samples extracted from test pits where construction of the new office facilitites is currently under way verified that soil contamination does exist. Contamination appears concentrated south of the concrete wall which was once oriented east-west and has since been removed.

Iso-Par tanks were located east of a ramp structure, which has subsequently been removed. Testing performed west of this former ramp structure indicated contamination existed and that the levels of contamination measured with the photo-ionizer approached ambient levels with depth. Contamination appears to be limited to approximately the first six feet of soil below ground surface. It is probable that the ramp structure acted as a barrier, and that the source of this contamination is different than the contamination which was detected east of the ramp, where the Iso-Par tanks once existed. Positive levels of volatile organic contamination detected east of the ramp extended to the groundwater table. Free product was noted to be present on the water surface, indicating that migration of contaminant due to groundwater flow may have occurred. Furthermore, Menasha personnel recently noted the existence of soil contamination at a location described to be south of the access drive and east of test location #73. This observation was apparently made during the excavation for placement of a subgrade structure. The origin of this contamination is not known. However, soil or groundwater contamination was not apparent at test location #73, near weir #002. In another negative test, groundwater contamination was not apparent at test location #56. This location is adjacent to the east side of the existing warehouse.

The east-west concrete wall which once existed appears to have helped confine the migration of contaminant in a northerly direction. Two test locations #20 and #22, located north of the concrete wall, indicated no levels above background with the photo-ionizer at depths of 4 and 10 feet below ground surface.

Although the extent of the contamination has been investigated in several directions, its east and northeast extent under the paper plant have not been investigated. Furthermore, the vertical extent of contamination in this area has not been defined. Soil borings for the foundation design of the new office facilities were conducted by Professional Service Industries, Inc. (PSI) in April, 1986. the enclosed appendix contains a photocopy of PSI's log for boring number 7, which was located on the north end of the previously existing concrete ramp. The log indicates that an oil odor existed in soil samples collected to a depth of 20.5 feet, where the boring was terminated.

Soil contamination was suspected to exist due to oil barrels which were once stockpiled west of weir #002. Although the ground surface appeared to be oil stained, soils sampled at a depth of 6 feet below ground surface indicated no apparent volatile organics present.

Soil and groundwater contamination was also encountered during the excavation of unsuitable material for the placement of footings for the warehouse addition. The contaminant was concentrated below a one foot organic peat layer and free product was again present on groundwater. Test pits located at the center of the construction site and adjacent to the west side of the existing warehouse indicated the presence of volatile organics at groundwater level.

The horizontal extent of contaminant migration in this area was defined by test locations #108 and #111 which lie south and west of the new warehouse construction, respectively. No volatile organics were detected at groundwater level.

Concerning the vertical extent of contamination in this area, soil samples were also obtained below groundwater level at test location #94. Contamination appeared to be present to 6 feet below the groundwater table. At this depth, a brown fine grained sand was encountered which registered only background levels with the photo-ionizer. In this area of the site it appears that contamination is migrating through the soil and groundwater, concentrating migration below the peat layer. The source of this contamination is not known.

Summary

Soils and groundwater testing for volatile organic contamination was conducted by STS Consultants, Ltd. for the Menasha Paper Corporation at the Paperboard Plant located in Otsego, Michigan. During the course of construction for the addition of office and warehouse facilities, several areas of the site were investigated to determine the existence and extent of contaminant migration.

Although all sources of contamination are not known, it is believed that at least two sources of contamination may have once existed. Soil and groundwater contamination in the area of the new office facilities is believed to be the result of fuel oil and Iso-Par contamination. The extent of this contamination has not yet been clearly defined, as there was soil contamination observed by Menasha personnel during excavation of soils south of the soil drive and east of weir #002.

Soil and groundwater contamination from an unknown source of volatile organics was also observed in the area of the warehouse addition. The extent of contamination was defined in two directions, as there was no apparent contamination at two test locations south and west of the warehouse construction.

STS is pleased to have been involved in this investigation, and we look forward to possible future work with Menasha in developing remedial actions. If you have any questions regarding this letter report, please do not hesitate to call.

Sincerely,

STS CONSULTANTS, LTD.

William E. Holman

William E. Holman, P.E.
Project Engineer

Bernard B. Sheff

Bernard B. Sheff, EIT
Geo-Environmental Manager

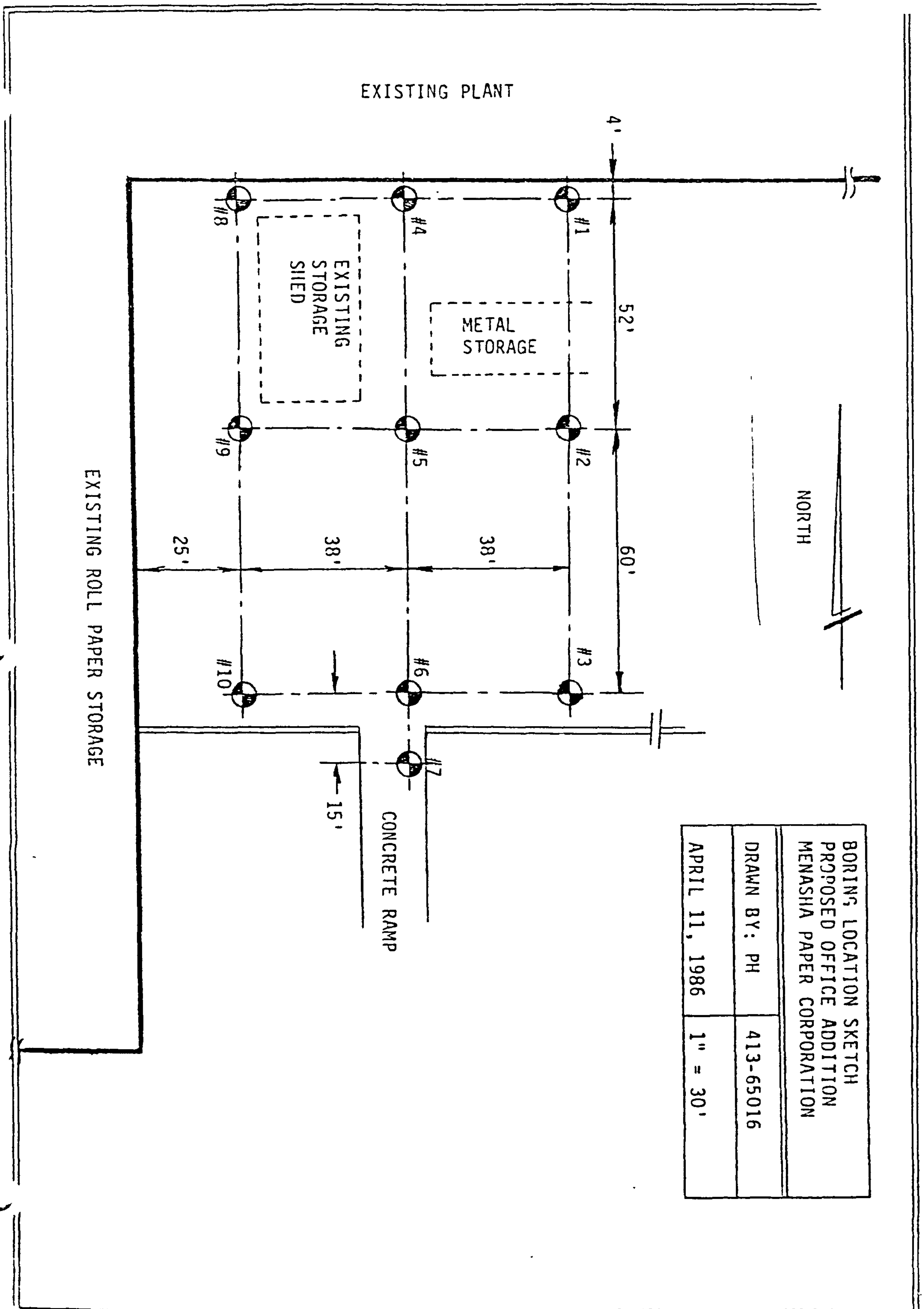
BBS/lch

STS Project No. 1083

GENERAL QUALIFICATIONS

STS Consultants, Ltd. was retained by Menasha Paper Corporation to perform soil testing for contamination assessment at the Menasha Paperboard Plant in Otsego, Michigan. The information presented in this report, its conclusions, and recommendations included herein are based upon information obtained by STS Consultants, Ltd. from discussions with Menasha personnel, soil testing from test locations illustrated in figures of this report, and drawings supplied by Menasha Corporation. Horizontal and vertical variation in the subsurface conditions between test locations may exist.

Field tests performed for this project were for the purpose of evaluating the contamination which exists at the site. Data was collected for purposes outlined in this report and should not be used for reasons other than intended.


EXISTING PLANT
4'
#8
#4
#1
EXISTING STORAGE SHED
METAL STORAGE
52'
#9
#5
#2
NORTH
EXISTING ROLL PAPER STORAGE
25'
38'
38'
60'
#10
#6
#3
#7
15'
CONCRETE RAMP
BORING LOCATION SKETCH
PROPOSED OFFICE ADDITION
MENASHA PAPER CORPORATION
DRAWN BY: PH
413-65016
APRIL 11, 1986
1" = 30'
Professional Service Industries

PSI

Professional Service Industries, Inc.

SOIL BORING NO. ______ JOB NO. ______

PROJECT Office and Warehouse Additions Menasha Paper Corporatior

MEN01933

SURFACE ELEV 96.9 DATE 4-6-86 LOCATION Otsego, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows Per 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp Strength PSF.	Str. %
	0–1		8" CONCRETE						
A SS	2–3		Brown fine to medium SAND with some GRAVEL and BRICK, moist, loose (FILL)	1 1 5					
B SS	5		Brown to black mottled fine to medium SAND and GRAVEL, moist, with traces of BRICK, medium dense (FILL)	2 3 3					
C SS	7–8			4 6 5	15.6				
D SS	10			3 6 4					
E SS	15		Black SAND and GRAVEL, saturated, dense, oily odor	5 11 8					
F SS	20		Black fine to medium SAND and PEAT, with an oil odor, saturated, slightly compact	3 3 3					
	21		End of Boring @ 20' - 6"						

Depth scale: 1–25 ft

TYPE OF SAMPLE
- D DISTURBED
- UL UNDIST LINER
- ST SHELBY TUBE
- SS SPLIT SPOON
- RC ROCK CORE
- ( ) PENETROMETER

REMARKS:

*Cave in at 10'0" after completion

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30", Count Made At 6" Intervals

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	12 FT	0	INS
G W ENCOUNTERED AT	FT		INS
G W AFTER COMPLETION	* FT		INS
G W AFTER HRS	FT		INS
G W VOLUMES	medium to heavy		

OTSEGO MILL SITE EVALUATION BY EPA

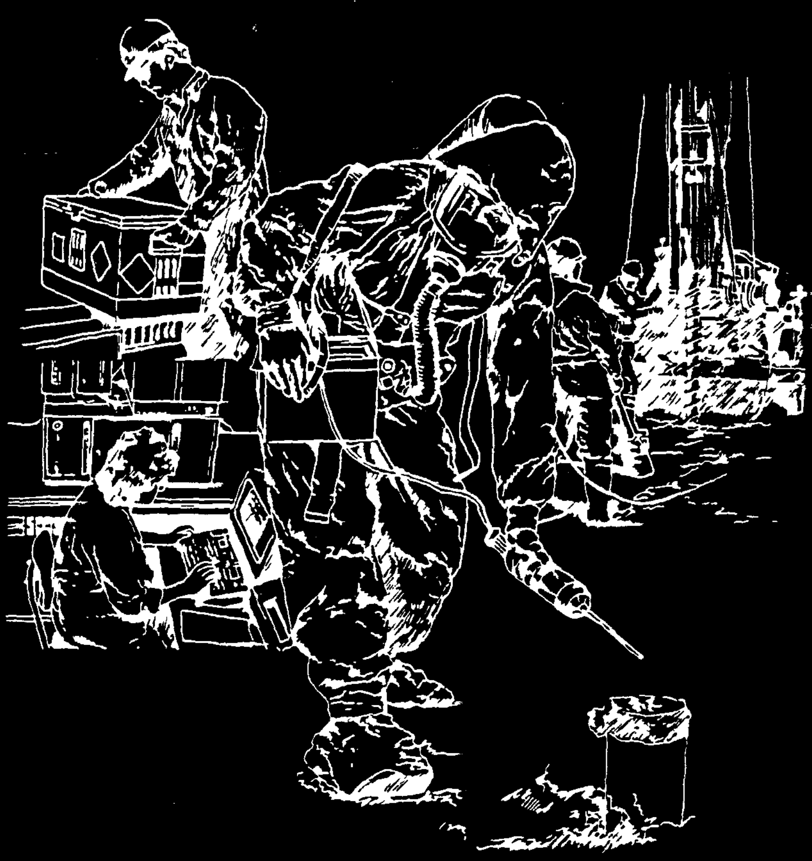
DOCUMENT #44

MEN01935

EPA

HAZARDOUS SITE EVALUATION DIVISION

Field Investigation Team Zone II



CONTRACT NO. 68-01-7347

ecology and environment, inc.

International Specialists in the Environment

MEN01936

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

MAR 19 1991

Keith Kling Env. Director
Menasha Corporation
320 N. Farmer Street
Otsego, MI 49078

REPLY TO ATTENTION OF:
5HSM-TUB7

Re: Site Inspection Report
Menasha Corporation
MID006 012 405

Dear Sir/Madam:

Several months ago, a contractor for the U.S. Environmental Protection Agency (U.S. EPA), Ecology and Environment, Inc., performed a Site Inspection (SI) at your facility. U.S. EPA has completed its review of the SI report and is now forwarding this copy to you.

This SI report includes site description; sample data; topographic and site specific maps; and photographs. Unfortunately, specific recommendations and conclusions being made by this Agency are not available at this time. If you wish to secure a second opinion of our results, the quality assurance data which describes the testing procedures can be obtained from this office upon request.

This completes the SI phase of our investigation. If you have any additional information or comments please forward them to me.

Thank you for your cooperation in this matter.

Sincerely yours,

William D. Messenger

William D. Messenger, Chief
Pre-Remedial Unit

MEN01937

SCREENING SITE INSPECTION REPORT
FOR
MENASHA CORPORATION
OTSEGO, MICHIGAN
U.S. EPA ID: MID006012405
SS ID: NONE
TDD: F05-9005-008
PAN: FMI0721SA

MARCH 5, 1991

ecology and environment, inc.
111 WEST JACKSON BLVD., CHICAGO, ILLINOIS 60604, TEL 312-663-9415
International Specialists in the Environment

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SIGNATURE PAGE
FOR
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1. INTRODUCTION

Ecology and Environment, Inc., Field Investigation Team (FIT) was tasked by the United States Environmental Protection Agency (U.S. EPA) to conduct a screening site inspection (SSI) of the Menasha Corporation (MC) site under contract number 68-01-7347.

The site was initially discovered by the Michigan Department of Natural Resources (MDNR) on December 3, 1979, when it prepared a Potential Ground Water Contamination Source Identification Preliminary Assessment form for Menasha Corporation (MDNR 1978).

The site was evaluated in the form of a preliminary assessment (PA) that was submitted to U.S. EPA. The PA was prepared by Cheryl Wallace of the MDNR Site Assessment Unit and is dated March 14, 1986 (MDNR 1986).

FIT prepared an SSI work plan for the MC site under technical directive document (TDD) F05-8703-026, issued on March 2, 1987. The SSI work plan was approved by U.S. EPA on May 9, 1990. The SSI of the MC site was conducted on June 25 through 27, 1990, under TDD F05-9005-008, issued on May 9, 1990.

The FIT SSI included an interview with site representatives, a reconnaissance inspection of the site, and the collection of 10 soil/ sediment samples, 7 monitoring well samples, and 4 surface water samples.

The purposes of an SSI have been stated by U.S. EPA in a directive outlining Pre-Remedial Program strategies. The directive states:

> All sites will receive a screening SI to 1) collect additional data beyond the PA to enable a more refined

> preliminary HRS [Hazard Ranking System] score, 2) establish priorities among sites most likely to qualify for the NPL [National Priorities List], and 3) identify the most critical data requirements for the listing SI step. A screening SI will not have rigorous data quality objectives (DQOs). Based on the refined preliminary HRS score and other technical judgement factors, the site will then either be designated as NFRAP [no further remedial action planned], or carried forward as an NPL listing candidate. A listing SI will not automatically be done on these sites, however. First, they will go through a management evaluation to determine whether they can be addressed by another authority such as RCRA [Resource Conservation and Recovery Act].... Sites that are designated NFRAP or deferred to other statutes are not candidates for a listing SI.
>
> The listing SI will address all the data requirements of the revised HRS using field screening and NPL level DQOs. It may also provide needed data in a format to support remedial investigation work plan development. Only sites that appear to score high enough for listing and that have not been deferred to another authority will receive a listing SI. (U.S. EPA 1988)

U.S. EPA Region V has also instructed FIT to identify sites during the SSI that may require removal action to remediate an immediate human health or environmental threat.

2. SITE BACKGROUND

2.1 INTRODUCTION

This section presents information obtained from SSI work plan preparation, the site representative interview, and the reconnaissance inspection of the site.

2.2 SITE DESCRIPTION

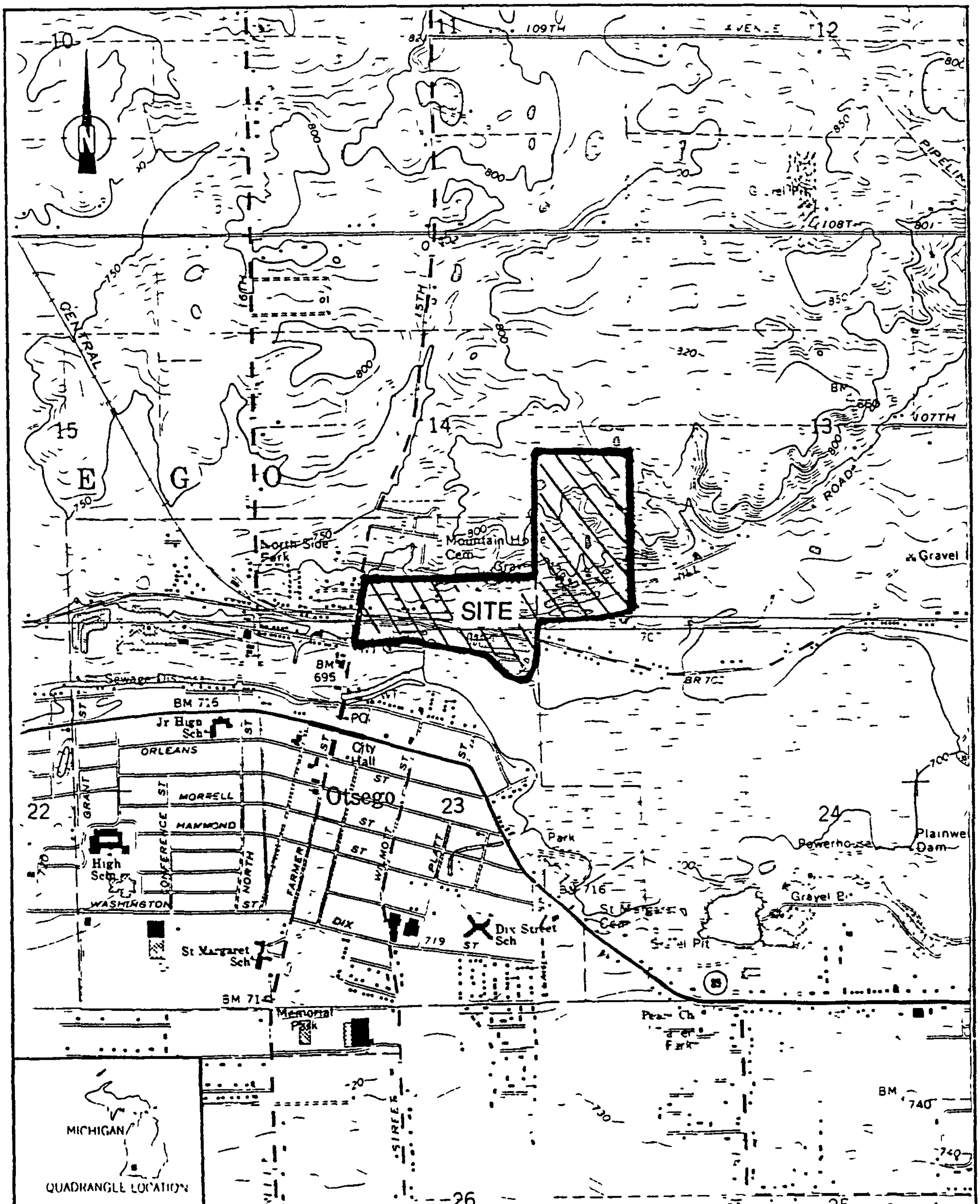
The MC site is an active paper mill. The site has been used as a paper mill since 1887 (Kling et al. 1990). The site is located at 350 North Farmer Street, Otsego Township, Allegan County, Michigan (SE1/4SW1/4 sec. 14 and NE1/4NW1/4 sec. 23, T.1N., R.12W.) (see Figure 2-1 for site location). The site is approximately 90 acres in area and is located on the Kalamazoo River on the far northeast side of Otsego, Michigan.

A 4-mile radius map of the MC site is provided in Appendix A.

2.3 SITE HISTORY

The MC site is currently owned by Menasha Corporation. Between 1887 and 1934, Barden Paper Mill owned and operated a paper mill at the site. Between 1934 and 1939, Otsego Falls Paper Mill took over operation of the mill. Since 1939, Menasha Corporation has owned and operated the site. Site ownership was shared with David Green between 1939 and 1955, but the site has been owned solely by Menasha Corporation since 1955 (Kling et al. 1990).

Menasha Corporation currently manufactures paper on-site by using wood chips and bails of corrugated cardboard boxes. The wood chips and



SOURCE: USGS, Otsego, MI Quadrangle, 7.5 Minute Series, 1967, Photorevised 1973.

SCALE

0 ½ 1 MILE

FIGURE 2-1 SITE LOCATION

boxes are placed in a hydrapulper to be broken down into fibers, which are then sent through a cleaning process. The fibers are then sent to a digester, where they are cooked with sodium carbonates. The by-products of the digester process include sodium carbonates and ligments, known as "spent liquor," and process wastewater. The process wastewater is sent through a series of two settling ponds, a clarifier, and a large aeration pond. The process wastewater is treated in the aeration pond to lower its biological oxygen demand and to capture suspended solids. Water is discharged from the aeration pond into the Kalamazoo River via a weir house near Outfall 000 and then through Outfall 003. The sludge from the clarifier is sent to a biological waste treatment pond. The sludge is later stored for sludge farming on nearby farms. The spent liquor is stored in three liquor ponds on-site, one lined with asphalt and the other two lined with cement. The spent liquor is later sent to a spent liquor incinerator on-site. The ligments are burned-out and the sodium carbonate ash is reused as a digester cooking chemical (Kling et al. 1990).

Prior to 1984, the wood chips used in producing the paper were cooked with sodium carbonate and sodium hydroxide. Wastes generated from this manufacturing process consisted of spent cooking liquor and sludge containing sodium carbonate and sodium hydroxide. These wastes were deposited in approximately 32 ponds in the northeast portion of the site. Waste sludges were treated in the large aeration pond and disposed of in an on-site Type III landfill owned and operated by Menasha Corporation. This landfill was in operation from 1969 to 1984. It is not known where waste sludges were disposed of prior to 1969. Fly ash from two coal-operated power boilers used for plant operations was also disposed of in the landfill on-site. All Type III waste material generated from Menasha Corporation processes was disposed of in the on-site landfill. No other waste from outside sources was disposed of at the landfill (Kling et al. 1990).

In January 1973 two of the on-site spent liquor holding ponds reached their capacity. In March 1973 an emergency spent liquor storage pond, located immediately upgradient of two Otsego standby municipal wells, was put into operation to alleviate the overflowing of the two other spent liquor ponds. This emergency spent liquor pond is no longer in use. In summer 1974 and 1975 the spent liquor was used as road binder on-site (Bonham 1988).

In April 1974, a nearby resident reported a color change in the drinking water obtained from his private well. By June 1975, six other nearby residential wells and the two standby municipal wells showed evidence of groundwater contamination. No residential or municipal well sampling results could be found in MDNR files. MDNR believed that the groundwater contamination was originating from the emergency spent liquor storage pond on the MC site (Bonham 1988). In response to the complaints, Menasha Corporation purchased the contaminated standby municipal wells and used them as production wells for the paper mill. Menasha Corporation then installed two new municipal wells at another location (see Appendix A for municipal well locations). Menasha Corporation also paid for the hook-up of nearby residences to the new municipal water supply (Bonham 1988).

In April 1981 Menasha Corporation hired CH2M Hill Michigan, Inc. (CH2M Hill), to conduct a hydrogeologic investigation of the on-site landfill. During the investigation seven monitoring wells were installed surrounding the landfill. Groundwater collected from these monitoring wells did not reveal any significant levels of contamination (CH2M Hill 1981).

In 1985, 3 ash and lime ponds and the 32 sludge ponds were drained, dredged, and excavated, and the soil was transported off-site to Water-vliet (Orchard Hill) Type II Landfill of WaterVliet, Michigan. After the ponds were excavated they were backfilled with soil (Kling et al. 1990; Kling 1990).

From the mid to late 1970s, Menasha Corporation received several notices of noncompliance and violation of its National Pollutant Discharge Elimination System (NPDES) permit for its three on-site discharge outfalls (000, 002, and 003) (MDNR 1978).

On May 21, 1985, MDNR issued Menasha Corporation a new NPDES permit for all three of its outfalls that expired on May 31, 1990. Critical materials listed in the NPDES permit application that are used in plant operations include copper (85 pounds per year), lead (513 pounds per year), and zinc (1,264 pounds per year), as well as arsenic, chromium, and cyanides. On October 14, 1985, MDNR collected samples from the outfalls. Samples collected from Outfall 002 revealed 1,2-dichloroethane at 36 μg/L and bromoform at 33 μg/L. Samples collected from outfall 003 revealed toluene at 2 μg/L and 1,2-dichloroethane at 1 μg/L (MDNR 1978). On September 15 and 16, 1986, MDNR conducted an Industrial Waste Water Survey at the MC site that included the collection of water samples from all outfalls. The sample collected from Outfall 000 revealed chromium at 80 μg/L, copper at 100 μg/L, and lead at 50 μg/L (MDNR 1986a).

On December 2, 1987, Menasha Corporation hired Soil Testing Services Consultants, Ltd. (STS), to install two monitoring wells on-site, one on the northeast side of the emergency spent liquor pond and the other on the southwest side of the pond. STS also installed several other wells throughout the site (Bonham 1988).

On April 18, 1988, Menasha Corporation and MDNR again collected samples from all the outfalls. The sampling results revealed the presence of phenols at 1,200 μg/L in samples collected from Outfall 002 (MDNR 1988).

On June 1, 1989, MDNR performed an NPDES Compliance Inspection of the MC site. No violations were documented during this inspection (Bantjes 1989).

On July 21, 1988, Menasha Corporation requested that MDNR remove the MC site from the Final Priority List of the Michigan Environmental Response Act 307. In its request, Menasha Corporation stated that no further contamination was occurring at the site, and that all volunteer remediation work had been completed by Menasha Corporation (Bonham 1988).

Menasha Corporation currently samples five monitoring wells on-site quarterly, two at the landfill and three at the farm sludge area, to comply with an MDNR request (Kling 1990a).

Menasha Corporation is currently operating under interim status for its NPDES permit. A new NPDES permit was approved by MDNR, Surface Water Quality Division, that goes into effect December 1, 1990 (Kling 1990a).

3. SCREENING SITE INSPECTION PROCEDURES AND FIELD OBSERVATIONS

3.1 INTRODUCTION

This section outlines procedures and observations of the SSI of the MC site. Individual subsections address the site representative interview, reconnaissance inspection, and sampling procedures. Rationales for specific FIT activities are also provided. The SSI was conducted in accordance with the U.S. EPA-approved work plan, with the exception that FIT collected one additional monitoring well sample to better characterize groundwater at the site.

The U.S. EPA Potential Hazardous Waste Site Inspection Report (Form 2070-13) for the MC site is provided in Appendix B.

3.2 SITE REPRESENTATIVE INTERVIEW

Randy Livingston, FIT team leader, conducted an interview with Keith Kling, Environmental Director; John Bonham, Engineering and Technical Services Manager; and Len Myers, Technician, of Menasha Corporation in Otsego, Michigan, and John Blauwkamp, P.E., Senior Environmental Engineer, of Menasha Corporation in Neenah, Wisconsin. Scott Turek of FIT was also present. The interview was conducted on June 25, 1990, at 1:15 p.m., at 350 North Farmer Street, Otsego, Michigan, inside the main plant building. The interview was conducted to gather information that would aid FIT in conducting SSI activities.

3.3 RECONNAISSANCE INSPECTION

Following the site representative interview, FIT conducted a reconnaissance inspection of the MC site and surrounding area in accordance with Ecology and Environment, Inc. (E & E), health and safety guidelines. The reconnaissance inspection began at 2:30 p.m. and included a walk-through of the site to determine appropriate health and safety requirements for conducting on-site activities and to make observations to aid in characterizing the site. FIT also determined sampling locations during the reconnaissance inspection. FIT was accompanied by Kling, Blauwkamp, Bonham, and Myers during the reconnaissance inspection.

Reconnaissance Inspection Observations. The MC site is located on the northeast side of the city of Otsego; half of the site extends outside the city boundary. Wetlands exist to the north and east of the site; farmlands exist to the north. Sparsely populated areas exist to the east and west of the site. The Kalamazoo River borders the site to the south. Three outfalls (000, 002, and 003) are located along the north bank of the river. A dam is located between Outfall 000 and Outfall 003.

The site is bordered by trees to the north, east, and west. Farmer Street and a cemetery border the site to the west. River Street and Penn Central Railroad tracks run east-west through the southern portion of the site. The nearest residences are located approximately 200 feet west and east of the site boundary. Only the southern portion of the site, south of River Street, is fenced (see Figure 3-1 for site features). Access to the site is from Farmer and River streets.

The main plant building is located at the southeast corner of the intersection of River Street and Farmer Street. According to Kling, an area south of the main plant building was formerly a spent liquor pond. This area has been backfilled with soil. FIT observed the two small settling ponds, clarifier, and large aeration pond east of the main building. FIT observed stressed vegetation around this aeration pond. A vegetated area was located south of the aeration pond. According to Kling, this vegetated area at one time consisted of three ponds, used to dispose of ash and lime. A small aeration pond is located in the southwest corner of the site.

There are four weir buildings on-site. One weir building is south of the main entrance, near Outfall 002. Two other weir buildings are located between the clarifier and the east settling pond. Another weir

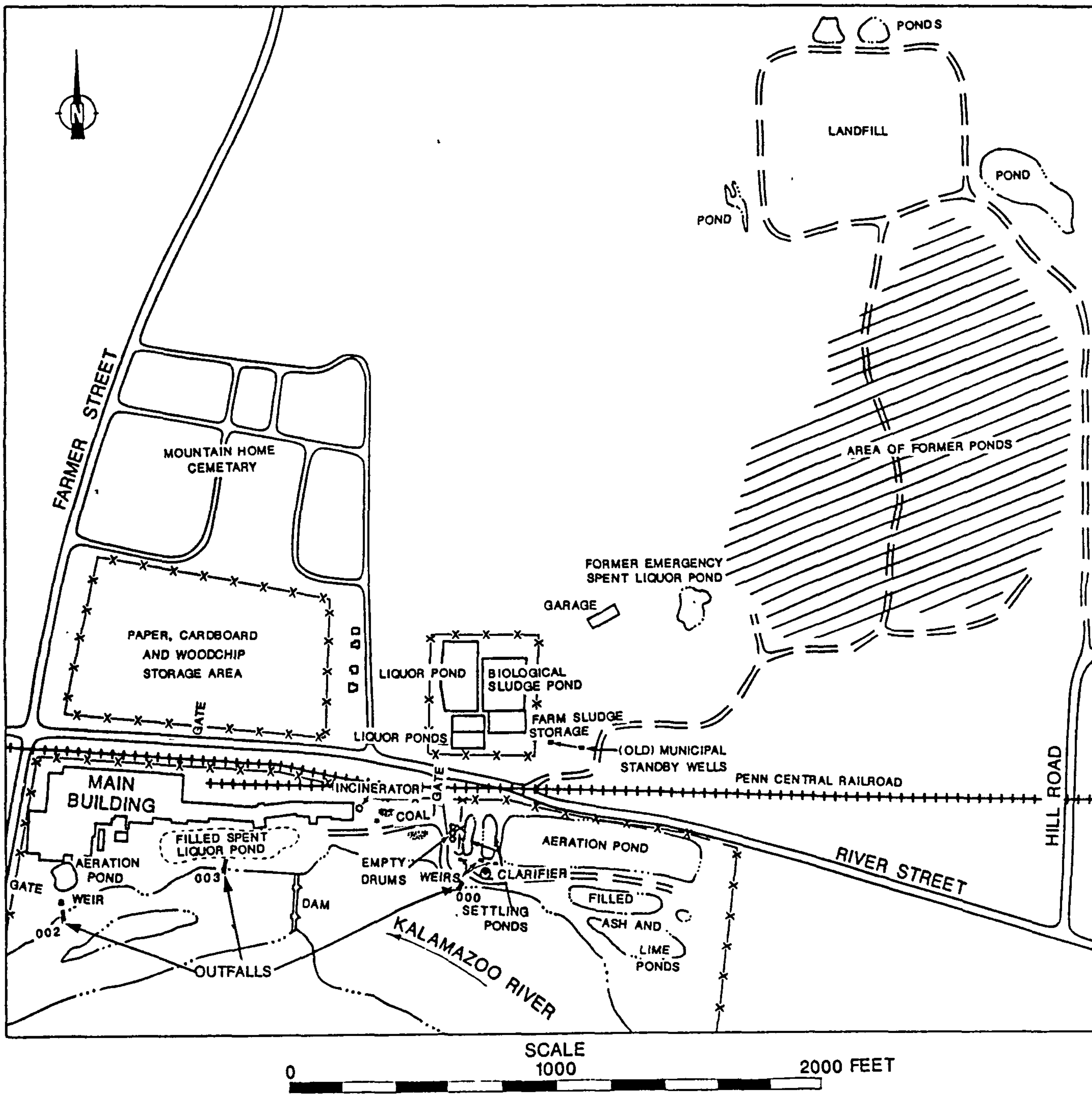


FIGURE 3-1 SITE FEATURES

building is located south of the west settling pond. Two production well buildings are located on the north side of River Street. These wells are the former standby municipal wells.

Four active ponds are located on-site on the north side of River Street, the three liquor ponds and the biological sludge pond. These ponds and the building where sludge is stored before being sent to farms are surrounded by a fence.

The former emergency spent liquor pond was located northeast of the active ponds and consisted of a partly vegetated depression. According to Kling, at one time 32 biological sludge ponds were located northeast of the emergency spent liquor pond. This area had been backfilled and vegetated prior to the time of the SSI.

The landfill was located in the northern portion of the site. The landfill was covered and vegetated. Several ponds were observed along the sides of the landfill.

FIT also observed the following site features: a spent liquor incinerator east of the main plant building; piles of coal east of the incinerator; a product storage tank south of the main plant building; a paper, cardboard, and wood chip storage area north of the main plant building; and a stack of empty drums along the west side of the settling ponds.

FIT photographs from the SSI of the MC site are provided in Appendix C.

3.4 SAMPLING PROCEDURES

Samples were collected by FIT at locations selected during the reconnaissance inspection to determine whether U.S. EPA Target Compound List (TCL) compounds or Target Analyte List (TAL) analytes were present at the site. The TCL and TAL are included with corresponding quantitation/detection limits in Appendix D.

On June 26, 1990, FIT collected five soil samples and five monitoring well samples. The site representatives were offered portions of each soil and monitoring well sample collected, and they accepted the offer. On June 27, 1990, FIT collected five soil/sediment samples and four surface water samples. The site representatives were offered portions of each soil/sediment and surface water sample collected, and they declined the offer.

Soil/Sediment Sampling Procedures. All subsurface soil/sediment samples were collected from depths of 1 to 8 feet. All surface soil samples were collected from depths of 0 to 6 inches. Surface soil sample S1 was collected from the southeast corner of the large aeration pond, where overflow had settled and dried (see Figure 3-2 for soil/ sediment sampling locations). Surface soil sample S2 was collected from soil in an area along the south side of the aeration pond, where overflow had settled and dried.

Subsurface soil sample S3 was collected, using a posthole digger, from soil in the middle of the former emergency spent liquor pond. The soil the sample was collected from changed color at depth. Subsurface soil sample S4 was collected, using a hand auger, from soil in the area where the 32 biological sludge ponds had existed at one time. Subsurface soil sample S5 was collected, using a posthole digger and a hand auger, from the northeast edge of the filled spent liquor storage pond south of the main plant building. The soil the sample was collected from changed color at depth.

Subsurface sediment sample S6 was collected, using a hand auger, from sediment in a settling pond west of the large aeration pond. Surface sediment sample S7 was collected from sediment in a pond on the north side of the landfill. Subsurface sediment sample S8 was collected, using a posthole digger, from a pond southwest of the landfill. Soil/sediment samples S1 through S8 were collected to determine whether TCL compounds or TAL analytes had accumulated in on-site soil.

Surface soil sample S9 was collected off-site from an area that appeared undisturbed and natural, east of the site boundary. Subsurface soil sample S10 was collected at a depth of 3 feet, just south of sampling location S9. Surface soil sample S9 and subsurface soil S10 were collected off-site as potential background soil samples to determine the representative chemical content of the soil in the area surrounding the site. Unless otherwise noted, all samples were collected with a garden trowel, placed in stainless steel bowls, mixed, and then transferred to sample bottles (E & E 1987). The sample

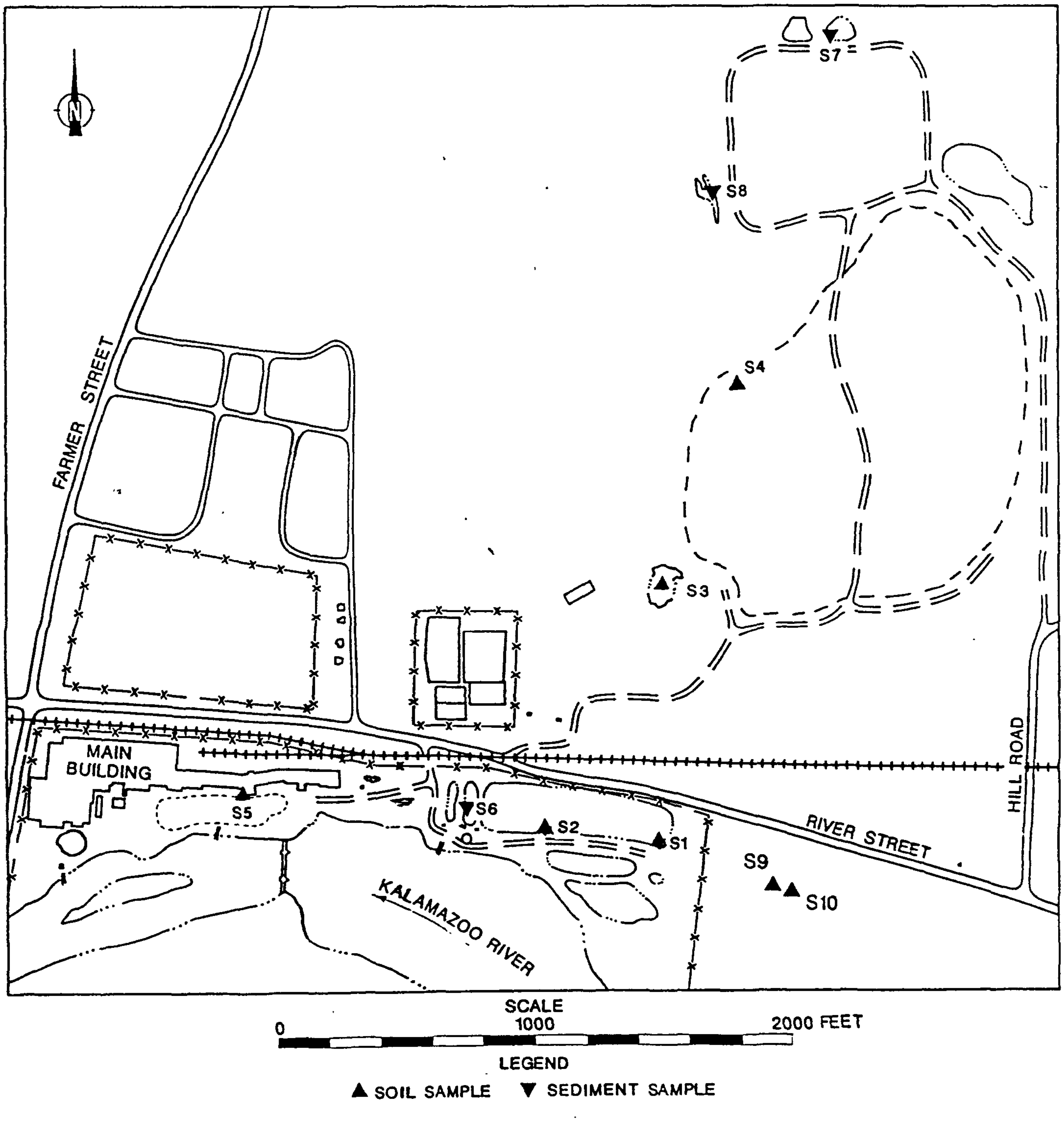


FIGURE 3-2 SOIL/SEDIMENT SAMPLING LOCATIONS

portions collected for volatile organic analysis were transferred directly into the sample bottles (E & E 1987).

Standard E & E decontamination procedures were adhered to during the collection of all 10 soil/sediment samples. The procedures included the scrubbing of all equipment (e.g., posthole digger, hand auger, stainless steel bowls, spoons, and trowels) with a solution of detergent (Alconox) and distilled water, and triple-rinsing the equipment with distilled water before the collection of each sample (E & E 1987). All 10 soil/sediment samples were packaged and shipped in accordance with U.S. EPA-required procedures.

As directed by U.S. EPA; all soil/sediment samples were analyzed using the U.S. EPA Contract Laboratory Program (CLP).

Monitoring Well Sampling Procedures. Monitoring well samples were collected by FIT from five on-site monitoring wells (see Table 3-1 for FIT designations of monitoring wells). Monitoring well MW1 was located east of the main plant building (see Figure 3-3 for monitoring well sampling locations). Monitoring well sample MW2 was collected from a production well located on the north side of River Street. Monitoring well sample MW2 was difficult to collect because of excessive bubbling of the well water from the outside tap. The bubbling problem of monitoring well MW2 may have affected the volatile organic sampling results. Monitoring well sample MW3 was collected on the southwest side of the former emergency spent liquor pond. Monitoring well sampling locations MW1, MW2, and MW3 were selected as potential downgradient locations to determine whether TCL compounds and/or TAL analytes had migrated downgradient from the site.

Monitoring well sample MW4 and MW5 were collected as potential upgradient samples. Sample MW4 was collected northeast of the former emergency spent liquor pond. Monitoring well sample MW5 was collected north of the landfill. Because monitoring well elevation measurements were not available, FIT was unable to determine the groundwater flow direction at the site. However, according to a hydrogeological study conducted by CH2M Hill in April 1981, groundwater was flowing in a west-southwest direction beneath the site toward the Kalamazoo River. Based on this assumption, monitoring well MW4 is upgradient of the

Table 3-1

FIT Designations Of Monitoring Wells

Well	STS Well	CH2M Hill Well	Former Municipal Well	Menasha Corporation
MW1	--	--	--	PW-8
MW2	--	--	PW-6	PW-6
MW3	MW-P1	--	--	--
MW4	MW-P2	--	--	--
MW5	--	TH4	--	--

-- Not applicable.

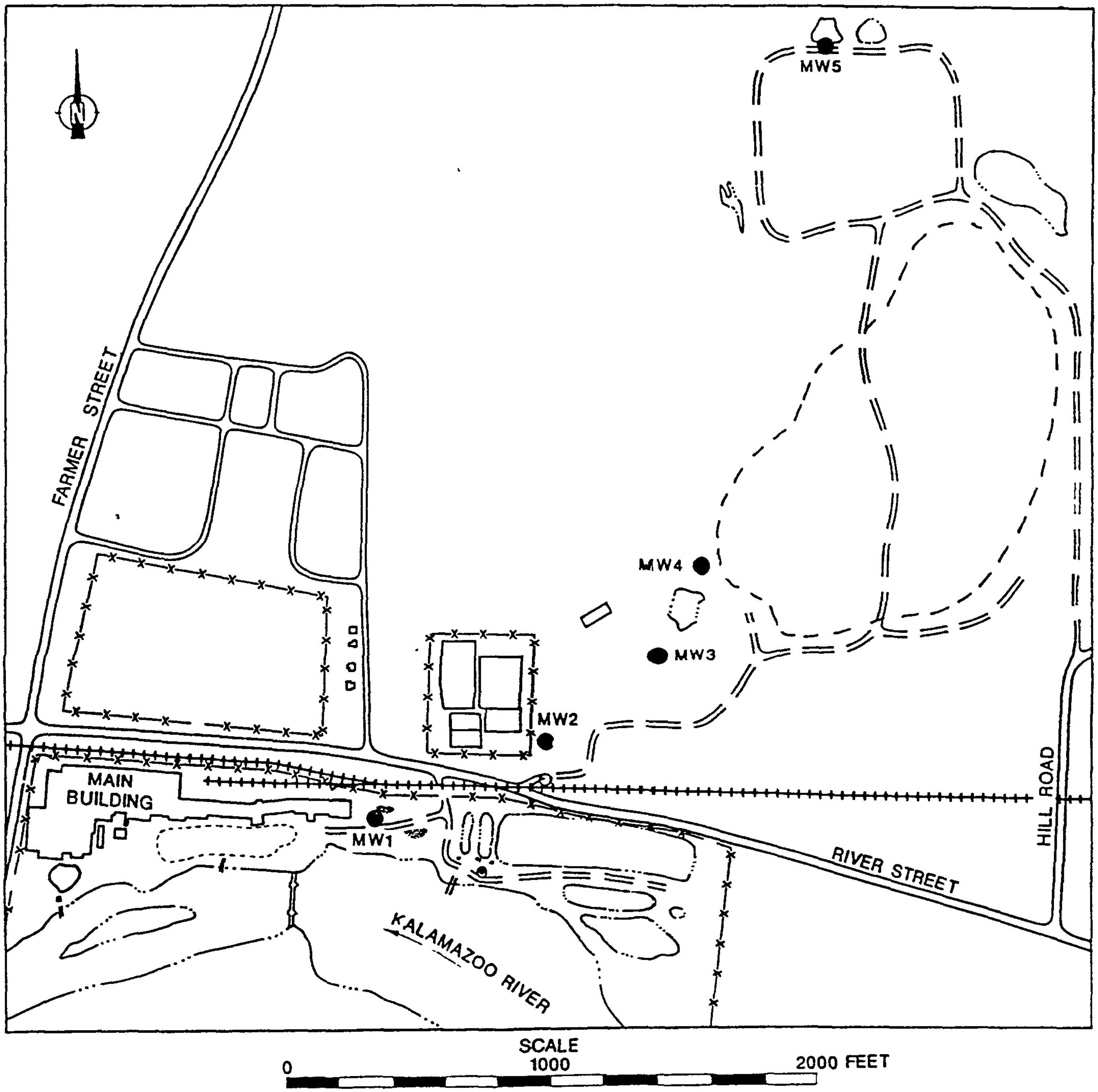


FIGURE 3-3 MONITORING WELL SAMPLING LOCATIONS

former emergency spent liquor pond, and well MW5 is upgradient from the landfill (see Table 3-2 for monitoring well data).

In accordance with U.S. EPA quality assurance/quality control (QA/QC) requirements, a duplicate monitoring well sample and a field blank sample were collected. The duplicate sample was collected at location MW1. The field blank sample was prepared from distilled water.

All monitoring wells were purged of three to five volumes of standing water prior to the collection of each sample. Monitoring well samples MW3, MW4, and MW5 were collected with stainless steel bailers that had been scrubbed with a solution of detergent (Alconox) and distilled water, and triple-rinsed with distilled water prior to the collection of each sample (E & E 1987). Monitoring well samples MW1 and MW2 were collected straight from the taps of the production wells.

As directed by U.S. EPA, all monitoring well samples were analyzed using the U.S. EPA CLP.

Surface Water Sampling Procedures. FIT collected four surface water samples during the SSI. The Kalamazoo River flows in a westerly direction past the site. Surface water samples SW1 and SW4 were collected from the Kalamazoo River. Surface water sample SW2 was collected from the discharge of Outfall 003 before it entered the Kalamazoo River. Surface water sample SW3 was collected from the discharge of Outfall 002 before it entered the Kalamazoo River.

Surface water sample SW1 was collected on the east side of the dam as an upstream sample to determine the surface water constituents common to the river (see Figure 3-4 for on-site surface water sampling locations). Surface water sample SW2 was collected from the discharge of Outfall 003, located south of the main plant building. This sample contained excessive bubbles. The volatile organic results may have been affected by the bubbling. Surface water sample SW3 was collected from a weir building located southeast of the main site entrance. The water from this weir is discharged through Outfall 002. Surface water samples SW2 and SW3 were collected at these locations to determine whether TCL compounds and/or TAL analytes were being discharged to the Kalamazoo River from the on-site facility.

Table 3-2

MONITORING WELL DATA

Well	Well Depth (feet)	Depth to Water (feet)
MW1*	NA	NA
MW2*	99.80	NA
MW3	48.50	40.82
MW4	46.50	33.78
MW5	137.00	106.70

* Production wells.

NA Not available.

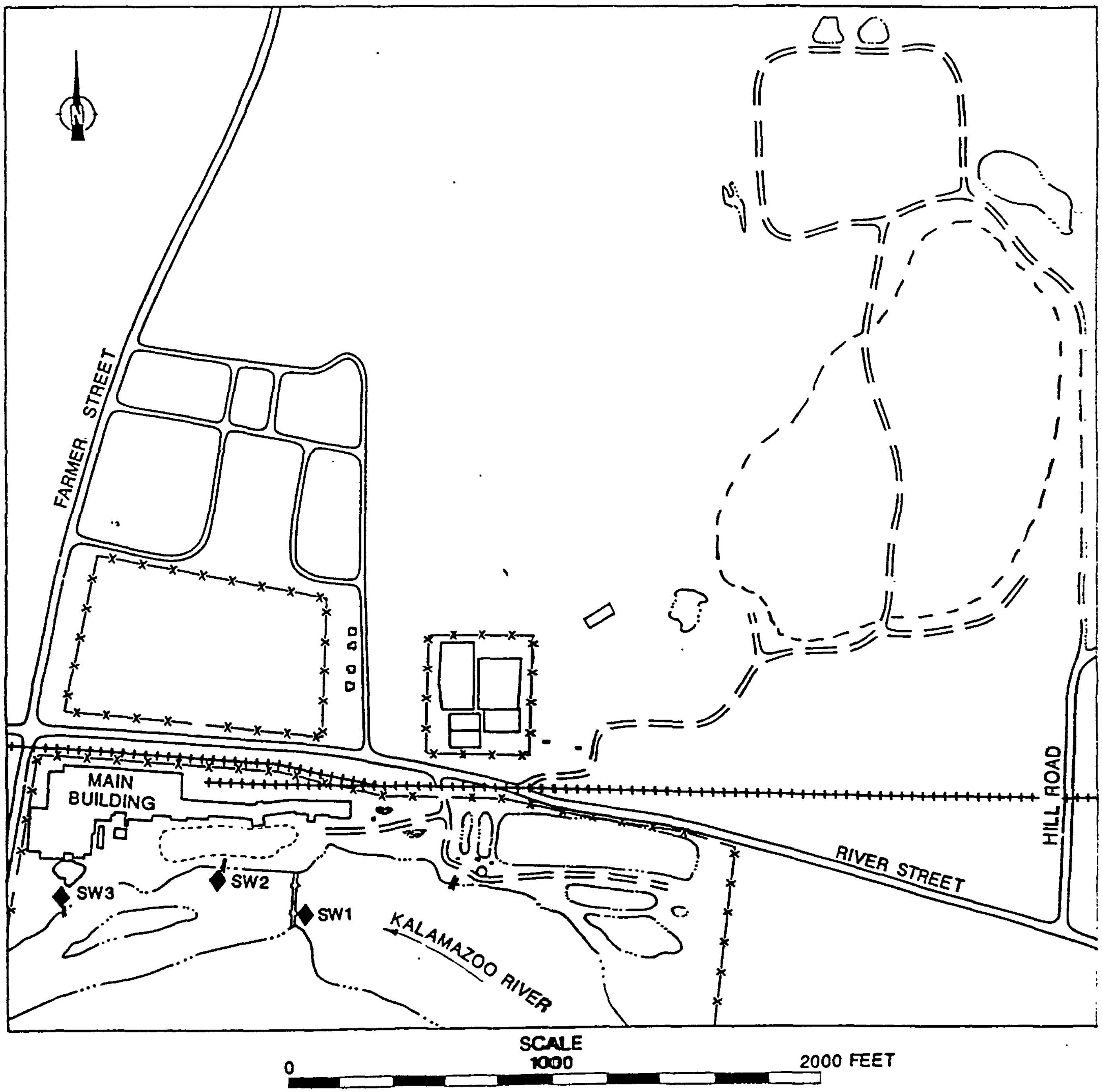


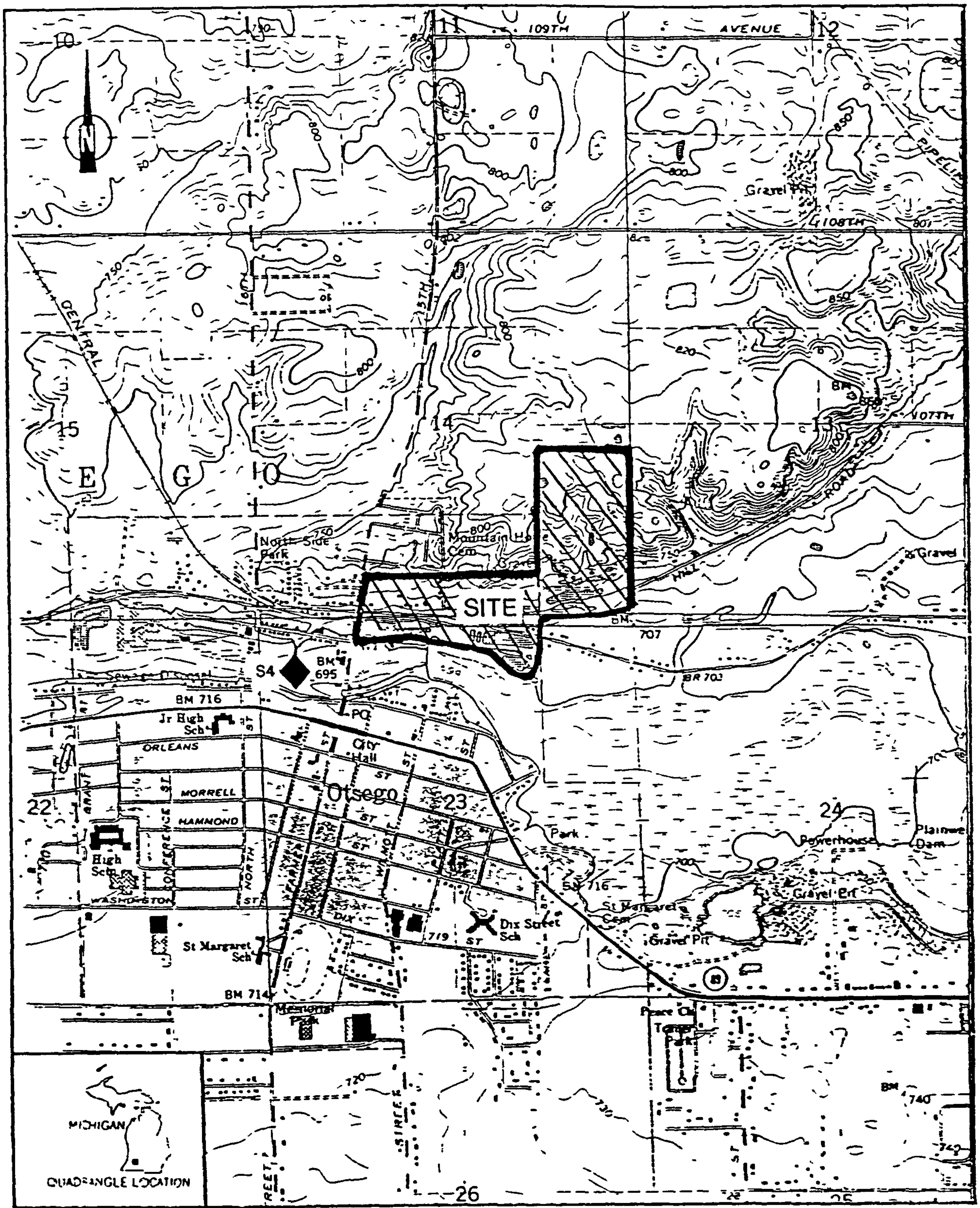
FIGURE 3-4 SURFACE WATER SAMPLING LOCATIONS

Surface water sample SW4 was collected near the bank of the river, north of the property at 308 Water Street (see Figure 3-5 for additional surface water sampling location). Surface water sample SW4 was selected as a potential downstream sample to determine whether TCL compounds and/or TAL analytes had migrated from the site.

In accordance with the U.S. EPA QA/QC requirements, a duplicate surface water sample and a field blank sample were collected. The duplicate sample was collected at sample location SW1. The field blank sample was prepared from distilled water.

Surface water samples SW1 and SW4 were collected by submerging sample bottles directly into the water. Surface water sample SW2 was collected with a stainless steel dip cup, by filling the cup at the point of discharge and transferring the surface water sample to sample bottles. The stainless steel dip cup had been scrubbed with a solution of detergent (Alconox) and distilled water, and triple-rinsed with distilled water prior to the collection of the sample (E & E 1987). Surface water sample SW3 was collected by submerging sample bottles directly into the weir water.

As directed by U.S. EPA, all surface water samples were analyzed using the U.S. EPA CLP.



SOURCE: USGS, Otsego, MI Quadrangle, 7.5 Minute Series, 1967, Photorevised 1973.

SCALE
0 ½ 1 MILE

FIGURE 3-5 ADDITIONAL SURFACE WATER SAMPLING LOCATION

4. ANALYTICAL RESULTS

This section presents results of the chemical analysis of FIT-collected soil/sediment, monitoring well, and surface water samples for TCL compounds and TAL analytes. All samples were analyzed for volatile organics, semivolatile organics, pesticides/polychlorinated biphenyls (PCBs), metals, and cyanides. Complete chemical analysis results of FIT-collected soil/sediment, monitoring well, and surface water samples are provided in Tables 4-1, 4-2, and 4-3, respectively.

Quantitation/detection limits used in the analysis of all samples are provided in Appendix D.

The analytical data for the chemical analysis of soil/sediment, monitoring well, and surface water samples collected for this SSI have been reviewed by U.S. EPA for compliance with terms of CLP, and the review has been approved by U.S. EPA. The analytical data have also been reviewed by FIT for validity and usability. Any additions, deletions, or changes to the data have been incorporated in the chemical analysis results tables presented in this section.

Table 4-1
RESULTS OF CHEMICAL ANALYSIS OF
FIT-COLLECTED SOIL/SEDIMENT SAMPLES

Sample Collection Information and Parameters	Sample Number S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Date	6/26/90	6/26/90	6/26/90	6/26/90	6/26/90	6/27/90	6/27/90	6/27/90	6/27/90	6/27/90
Time	1345	1410	1450	1515	1615	1200	1235	1250	1220	1230
CLP Organic Traffic Report Number	ELR54	ELR55	ELR56	ELR57	ELR58	ELR59	ELR60	ELR61	ELR62	ELR63
CLP Inorganic Traffic Report Number	MELP45	MELP46	MELP47	MELP48	MELP49	MELP50	MELP51	MELP52	MELP53	MELP54
Compound Detected (values in ug/kg)										
Volatile Organics										
carbon disulfide	--	--	--	--	6J	--	15J	--	--	--
toluene	--	5J	--	2J	--	5J	91J	--	2J	--
Semivolatile Organics										
phenanthrene	--	--	--	--	240J	--	--	--	--	--
fluoranthene	--	--	--	--	--	--	--	--	140J	--
pyrene	--	--	--	--	380J	--	--	--	190J	--
benzo[a]anthracene	--	--	--	--	--	--	--	--	130J	--
chrysene	--	--	--	--	170J	--	--	--	170J	--
bis(2-ethylhexyl)phthalate	130J	380J	--	--	--	660J	--	--	--	53J
[illegible][1,2,3-cd]pyrene	--	--	--	--	110J	--	--	--	--	--
Analyte Detected (values in mg/kg)										
aluminum	2,690	3,240	3,800	3,100	1,590	2,270	6,010	10,500	3,310	4,500
arsenic	8.8NJ	4.5NJ	3.5NJ	3.2NJ	2.9NJ	5.9NJ	8.3BNJ	6.9NJ	10.2NJ	3.5NJ
barium	21B	31.4B	31.9B	17.5B	13.2B	31.1B	80.5B	56	58.7	38B
beryllium	--	7.6	--	--	--	--	--	0.57B	0.25B	--
calcium	25,400	23,800	1,120B	3,960	26,000	21,600	7,220	33,000	23,400	710B
chromium	5.8	5.4	4.8	5.7	3.2	6.5	10.4B	17	5	5
cobalt	2.8B	3.7B	2.3B	2.4B	1.2B	2.3B	--	10.4B	3.2B	1.9B
copper	11.1	416	5.2BJ	5.8J	9.4	10.6	16.9B	15.1	12.8	5.3J
iron	7,900	7,730	5,310	5,050	3,920	6,720	9,740	21,600	14,900	7,570
lead	7.3	14.9	8.7	5.4	7.6	8.8	28	10.3	45.8	5.9
magnesium	9.010	11,200	799B	1,880	8,240	6,520	2,200B	13,500	8,180	750B
manganese	183	280	105	94.3	107	153	147	350	570	317
mercury	--	0.15NJ	--	--	0.11NJ	1.9NJ	7.9NJ	0.45NJ	0.68NJ	0.36NJ
nickel	6.6B	6.3B	4.7B	6.8B	3.7B	7B	--	27.5	8.8	5.4B
potassium	304B	396B	210B	183B	253B	298B	824B	1,490	320B	119B
sodium	286B	823B	30.4B	83B	198B	974B	3,230B	250B	60.5B	36.6B
vanadium	9.5B	7.4B	8.3B	8.4B	5B	9.4B	14.1B	21.7	8.9B	8B
zinc	20.9	28	25.8	14.4	17.1	29.2	38.9	63.9	67.4	16.1

-- Not detected.

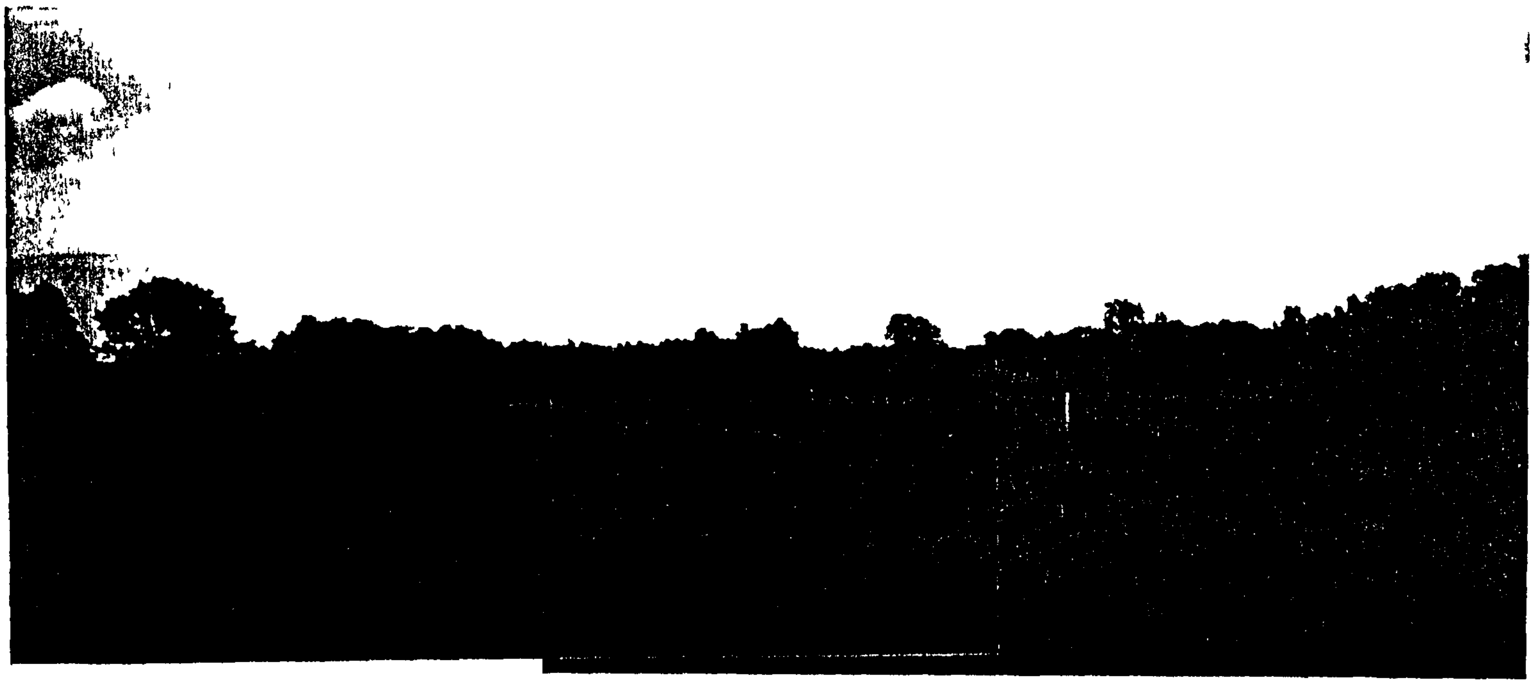
Table 4-1 (Cont.)

UND QUALIFIER	DEFINITION	INTERPRETATION
J	Indicates an estimated value.	Compound value may be semiquantitative.
ANALYTE QUALIFIERS	**DEFINITION**	**INTERPRETATION**
N	Spike recoveries outside QC protocols, which indicates a possible matrix problem. Data may be biased high or low. See spike results and laboratory narrative.	Value may be quantitative or semi-quantitative.
B	Value is real, but is above instrument DL and below CRDL.	Value may be quantitative or semi-quantitative.
J	Value is above CRDL and is an estimated value because of a QC protocol.	Value may be semiquantitative.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 28 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA



DATE: 6/27/90 TIME: 1331 DIRECTION OF PHOTOGRAPH: E + SE PHOTOGRAPHED BY: Randy Livingston

WEATHER CONDITIONS: Sunny, partly cloudy ~ 69°F SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows a panorama picture of the land fill and tree line.

MEN01967

APPENDIX D

U.S. EPA TARGET COMPOUND LIST AND TARGET ANALYTE LIST QUANTITATION/DETECTION LIMITS

MEN01969

Contract Laboratory Program
Target Compound List
Quantitation Limits

COMPOUND	CAS #	WATER	SOIL SEDIMENT SLUDGE
Chloromethane	74-87-3	10 ug/L	10 ug/Kg
Bromomethane	74-83-9	10	10
Vinyl chloride	75-01-4	10	10
Chloroethane	75-00-3	10	10
Methylene chloride	75-09-2	5	5
Acetone	67-64-1	10	5
Carbon disulfide	75-15-0	5	5
1,1-dichloroethene	75-35-4	5	5
1,1-dichloroethane	75-34-3	5	5
1,2-dichloroethene (total)	540-59-0	5	5
Chloroform	67-66-3	5	5
1,2-dichloroethane	107-06-2	5	5
2-butanone (MEK)	78-93-3	10	10
1,1,1-trichloroethane	71-55-6	5	5
Carbon tetrachloride	56-23-5	5	5
Vinyl acetate	108-05-4	10	10
Bromodichloromethane	75-27-4	5	5
1,2-dichloropropane	78-87-5	5	5
cis-1,3-dichloropropene	10061-01-5	5	5
Trichloroethene	79-01-6	5	5
Dibromochloromethane	124-48-1	5	5
1,1,2-trichloroethane	79-00-5	5	5
Benzene	71-43-2	5	5
Trans-1,3-dichloropropene	10061-02-6	5	5
Bromoform	75-25-2	5	5
4-Methyl-2-pentanone	108-10-1	10	10
2-Hexanone	591-78-6	10	10
Tetrachloroethene	127-18-4	5	5
Tolene	108-88-3	5	5
1,1,2,2-tetrachloroethane	79-34-5	5	5
Chlorobenzene	108-90-7	5	5
Ethyl benzene	100-41-4	5	5
Styrene	100-42-5	5	5
Xylenes (total)	1330-20-7	5	5

Table A
Contract Laboratory Program
Target Compound List
Semivolatiles Quantitation Limits

COMPOUND	CAS #	WATER	SOIL SEDIMENT SLUDGE
Phenol	108-95-2	10 ug/L	330 ug/Kg
bis(2-Chloroethyl) ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
Benzyl Alcohol	100-51-6	10	330
1,2-Dichlorobenzene	95-50-1	10	330
2-Methylphenol	95-48-7	10	330
bis(2-Chloroisopropyl) ether	108-60-1	10	330
4-Methylphenol	106-44-5	10	330
N-Nitroso-di-n-dipropylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
Benzoic Acid	65-85-0	50	1600
bis(2-Chloroethoxy) methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	300
4-Chloro-3-methylphenol	59-50-7	10	330
2-Methylnaphthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	50	1600
2-Chloronaphthalene	91-58-7	10	330
2-Nitroaniline	88-74-4	50	1600
Dimethylphthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
2,6-Dinitrotoluene	606-20-2	10	330
3-Nitroaniline	99-09-2	50	1600
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	50	1600
4-Nitrophenol	100-02-7	50	1600
Dibenzofuran	132-64-9	10	330
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
4-Chlorophenyl-phenyl ether	7005-72-3	10	330

Table A
Contract Laboratory Program
Target Compound List
Semivolatiles Quantitation Limits

COMPOUND	CAS #	WATER	SOIL SLUDGE SEDIMENT
Fluorene	86-73-7	10 ug/L	330 ug/Kg
4-Nitroaniline	100-01-6	50	1600
4,6-Dinitro-2-methylphenol	534-52-1	50	1600
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenyl-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	50	1600
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Di-n-butylphthalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3'-Dichlorobenzidine	91-94-1	20	660
Benzo(a)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330
Dibenz(a,h)anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330

Table A
Contract Laboratory Program
Target Compound List
Pesticide and PCB Quantitation Limits

COMPOUND	CAS #	WATER	SOIL SEDIMENT SLUDGE
alpha-BHC	319-84-6	0.05 ug/L	8 ug/Kg
beta-BHC	319-85-7	0.05	8
delta-BHC	319-86-8	0.05	8
gamma-BHC (Lindane)	58-89-9	0.05	8
Heptachlor	76-44-8	0.05	8
Aldrin	309-00-2	0.05	8
Heptachlor epoxide	1024-57-3	0.05	8
Endosulfan I	959-98-8	0.05	8
Dieldrin	60-57-1	0.10	16
4,4'-DDE	72-55-9	0.10	16
Endrin	72-20-8	0.10	16
Endosulfan II	33213-65-9	0.10	16
4,4'-DDD	72-54-8	0.10	16
Endosulfan sulfate	1031-07-8	0.10	16
4,4'-DDT	50-29-3	0.10	16
Methoxychlor (Mariate)	72-43-5	0.5	80
Endrin ketone	53494-70-5	0.10	16
alpha-Chlordane	5103-71-9	0.5	80
gamma-chlordane	5103-74-2	0.5	80
Toxaphene	8001-35-2	1.0	160
AROCLOR-1016	12674-11-2	0.5	80
AROCLOR-1221	11104-28-2	0.5	80
AROCLOR-1232	11141-16-5	0.5	80
AROCLOR-1242	53469-21-9	0.5	80
AROCLOR-1248	12672-29-6	0.5	80
AROCLOR-1254	11097-69-1	1.0	160
AROCLOR-1260	11096-82-5	1.0	160

Table A (Cont.)

CONTRACT LABORATORY PROGRAM
TARGET ANALYTE LIST (TAL)
INORGANIC DETECTION LIMITS

Compound	Procedure	Detection Limits: Water (µg/L)	Detection Limits: Soil Sediment Sludge (mg/kg)
aluminum	ICP	200	40
antimony	furnace	60	2.4
arsenic	furnace	10	2
barium	ICP	200	40
beryllium	ICP	5	1
cadmium	ICP	5	1
calcium	ICP	5,000	1,000
chromium	ICP	10	2
cobalt	ICP	50	10
copper	ICP	25	5
iron	ICP	100	20
lead	furnace	5	1
magnesium	ICP	5,000	1,000
manganese	ICP	15	3
mercury	cold vapor	0.2	0.008
nickel	ICP	40	8
potassium	ICP	5,000	1,000
selenium	furnace	5	1
silver	ICP	10	2
sodium	ICP	5,000	1,000
thallium	furnace	10	2
tin	ICP	40	8
vanadium	ICP	50	10
zinc	ICP	20	4
cyanide	color	10	2

3767:1

APPENDIX E

WELL LOGS OF THE AREA OF THE SITE

4 SEP 20 1976

WATER WELL RECORD

ACT 294 PA 1965

NW ?

MICH PL

MEN01975

1 LOCATION OF WELL

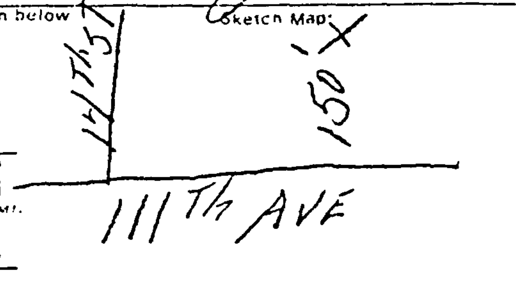
County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	OTSEGO	¼ ¼ ¼	1	1 N/S.	12 E/W.

Distance And Direction from Road Intersection: 2½ MILE W OF 14TH ST ON 111TH AVE

Street address & City of Well Location: RR#1-111TH AVE OTSEGO Mich

Locate with "X" in section below — 1 MILE

Sketch Map:



3 OWNER OF WELL: Robert Lester

Address: 1099-10Th ST Martin Mich

4 WELL DEPTH: (completed) 79 ft. Date of Completion: Aug 25-76

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Height: Above/Below Surface 1 ft.

Diam. 2 in. to 75 ft. Depth — Weight 3.75 lbs./ft.

2 in. to 75 ft. Depth — Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
STONES & GRAVEL	12'	12'
BROWN CLAY & SAND & GRAVEL	24'	36'
SAND & GRAVEL	43'	79'

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: STRAINER Dia.: 1¼"

Slot/Gauze 10 Length 4'

Set between 75 ft. and 79 ft.

Fittings: 1¼ cupling

9 STATIC WATER LEVEL: 54 ft. below land surface

10 PUMPING LEVEL below land surface

54 ft. after 1 hrs. pumping 12 g.p.m.

54 ft. after 1 hrs. pumping 12 g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Not Chlorides (Cl) Known

Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No

☐ Neat Cement ☐ Bentonite ☐

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination: Septic Direction NOT IN YET Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name: TAIT

Model Number: 10E1 HP 1 Volts 230

Length of Drop Pipe 63 ft. capacity 10 G.P.M.

Type: ☐ Submersible ☒ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
CORRECTED BY
ADDITION BY dw
ELEVATION
DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Bakers Well Drilling — 0488

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address: 300 Sherwood ST Otsego

Signed: Rip Baker — Date: Aug-30-76

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

4

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

MEN01976

1 LOCATION OF WELL

County: Allegan | Township Name: Otsego | Fraction: ¼ ¼ ¼ | Section Number: 11 | Town Number: 1 N/S | Range Number: 12 W.

Distance And Direction from Road Intersections: 1/10 M. N. of 108th Ave on 16th St

Street Address & City of Well Location: 899 N. 16th Otsego, Mich

Locate with "X" in section below — Sketch Map:

16th St — 121X — 108th Ave

1 MILE — 1 MI.

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Stones-Sand Gravel & Brown Clay	36'	36'
Quick Sand & Blue Clay	69'	105
Fine Sand	7'	112'

USE A 2ND SHEET IF NEEDED

3 OWNER OF WELL.
David Keith

Address: 899 N 16th Otsego, Mich

4 WELL DEPTH (completed)
112 ft. Date of Completion: Sept 4 - 76

5
☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug

☒ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE:
☒ Domestic ☐ Public Supply ☐ Industry

☐ Irrigation ☐ Air Conditioning ☐ Commercial

☐ Test Well ☐

7 CASING.
Threaded ☒ Welded ☐ — Height: Above/Below Surface 1 ft.

Diam.

2 in. to 105 ft. Depth — Weight 3.75 lbs./ft.

2 in. to 105 ft. Depth — Drive Shoe? Yes ☒ No ☐

8 SCREEN.
Type: Strainer Dia.: 1¼"

Slot/Gauze 10 Length 7'

Set between 105 ft. and 112 ft.

Fittings. 1¼" Cup

9 STATIC WATER LEVEL
60 ft. below land surface

10 PUMPING LEVEL below land surface
60 ft. after 1 hrs. pumping 12 g.p.m.

60 ft. after 1 hrs. pumping 12 g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Chloride (Cl) Not Known

Hardness ______ Other ______

12 WELL HEAD COMPLETION:
☐ In Approved Pit

☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted?
☐ Yes ☒ No

☐ Neat Cement ☐ Bentonite ☐ ______

Depth From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
75 feet NW Direction Septic Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:
☐ Not installed

Manufacturer's Name Tait

Model Number 10E3 HP 1 Volts 230

Length of Drop Pipe 84 ft. capacity ______ G.P.M.

Type: ☐ Submersible

☒ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Bailey Well Drilling 0488

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood Ct Otsego

Signed [signature] AUTHORIZED REPRESENTATIVE Date Sept 4-76

D67d 100M (Rev. 12-68)

LOCAL HEALTH DEPT COPY WELL 6

MEN01977

3

MICHIGAN
DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

M-15310

WELL SCHEDULE

Date February 14, 1963, 19____ Field No. PW#1

Record by JB Office No. Cust. No. 3

Source of data Driller's record

1. *Location:* State Michigan County Allegan-Otsego
   Map Approx. 122' S. of River St. & 150' E. of power plant near site of T.W. 62A
   ____ ¼ NE ¼ sec. 23 T 1N N/S R 12W E/W
2. *Owner:* Menasha Corp-Paperboard Div. Address Otsego
   formerly Otsego Falls Paper Mills)
   Tenant ____ Address ____
   Driller Layne-Northern Address by Paul Wyatt
3. *Topography* ____
4. *Elevation* ____ ft. above/below
5. *Type:* Dug, drilled, driven, bored, jetted Rotary 10-19-62
6. *Depth:* Rept. 83 ft. Meas. ____ ft.
7. *Casing:* Diam. 30 in., to 12 in., Type ____
   Depth 31 ft., Finish ____
8. *Chief Aquifer* ____ From ____ ft. to ____ ft.
   Others ____
9. *Water level* 13 ft. rept. 10-19-62 19____ below surface
   ____ which is ____ ft. above/below surface
10. *Pump:* Type ____ Capacity ____ G. M. ____
    Power: Kind ____ Horsepower ____
11. *Yield:* Flow ____ G. M., Pump ____ G. M., Meas., Rept. Est. ____
    Drawdown 50 ft. after ____ hours pumping 1001 G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. ____
    Adequacy, permanence ____
13. *Quality* ____ Temp. ____ °F.
    Taste, odor, color ____ Sample Yes/No ____
    Unfit for ____
14. *Remarks:* (Log, Analyses, etc.) 20' of Everdur Bronze W.J Cook Screen, 12" Dia. I.D. Opening .030 - 26" Casing cemented in 30" open hole drilled by reverse circulation method

Gravel pack 47' to 83': 6 yds of #1220 Silica gravel

GEOLOGICAL SURVEY SAMPLE No.

MEN01978

WATER WELL RECORD

ACT 294 PA 1965

MICH. DEPT. OF PUBLIC HEALTH

SW, SE, SW 14*

1 LOCATION OF WELL

County: ALLEGAN
Twp.: CITY OF OTSEGO — OTSEGO
Fraction: ¼ ¼ ¼
Section No.:
Town: 1 N/S
Range: 12 E/W

Distance And Direction from Road Intersections: 650' EAST OF FARMER ST. 250' NORTH OF RIVER ST

Street address & City of Well Location

OWNER No.

3 OWNER OF WELL

Address: Menasha Corporation Otsego Mich

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel & Clay	50'	50'
Sand yellow fine	20'	70'
Stones	2'	72'
Clay & stones	6'	78'
Gravel water bearing	12'	90'
10 feet below screen		
is gray water		
bearing sand		
fine		

4 WELL DEPTH: (completed) 90 ft. Date of Completion: Feb 1 - 1968

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☒ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐
Diam. 4 in. to 84 ft. Depth
in. to ft. Depth
Height: Above/Below surface 1 ft.
Weight lbs/ft.
Drive Shoe? Yes ☒ No ☐

8 SCREEN:
Type: Cook Dia.: 3"
Slot/Gauze: 10 slot Length: 6 feet
Set between 84 ft. and 90 ft.
Fittings: lead packer & bail bottom

9 STATIC WATER LEVEL
40 ft. below land surface

10 PUMPING LEVEL below land surface
82 ft. after 3 hrs. pumping 25 g.p.m.
ft. after hrs. pumping g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Chlorides (Cl)
Hardness

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 GROUTING:
Well Grouted? ☐ Yes ☒ No
Material: ☐ Neat Cement ☐
Depth: From ft. to ft.

14 SANITARY:
Nearest Source of possible contamination 300 feet South Direction River Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:
Manufacturer's Name: Tait
Model Number: B10L47 HP 1
Length of Drop Pipe 76 ft. capacity 25 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
ADDED INFO. BY DRILLER. ITEM NO.
CORRECTED BY: RR
ADDITION BY: RTS

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Lyle Ayers — REGISTERED BUSINESS NAME — 0473 REGISTRATION NO.
Address: Martin Mich
Signed: Lyle Ayers — AUTHORIZED REPRESENTATIVE — Date 2/1/68

D67D 100M 6-66 MAY 29 1968

GEOLOGICAL SURVEY COPY

APR 19 1972

MEN01979

5

INCORPORATED

INDIANAPOLIS • MISHAWAKA • LANSING

☐ TEST
☐ PERMANENT

WELL LOG No. 5 CITY Otsego County Allegan

Job No. 16312

Owner Menasha Corp. Township Otsega

Section 23 T1N R12

Location State Michigan

From Land Description 12' E. of North loading dock 10' S. of RR Approx.

From Street or Road 100' S. of River Street

FORMATION FOUND — DESCRIBE FULLY	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
	FROM NATURAL GROUND LEVEL			
Fill (Sand & Boulders)	0	8	8	
Brown Fine Sand	8	52	44	+
Sandy Clay with gravel	52	57	5	
Brown Sand (Fine)	57	60	3	
Fine Sand - Small gravel	60	70	10	26
Fine Sand	70	74	4	
Coarse Gravel and boulders	74	76	2	
Sandy Clay with gravel	76	77		

Erwin H. A. Stahl, P.

Hole 30 "Dia Drilled by: Cable Tool ____ Rotary ____ Jetting ____ Reverse Circ. x Bucket ____ Auger ____

Rotary ... Grout ... Neat Cement ____ Drilling Mud ____ Other ____

Casing 12 "OD From 12 "above ground to 60 feet below ground. Weight ____ Pounds per foot

Screen 12 " Set from 60 to 76 feet Make Johnson Type SS Slot 25

Pumping rate 5 GPM drawdown to 69 feet after 3 hours pumping

Date Completed 6-11-70 Dick Kerr

GEOLOGICAL SURVEY SAMPLE No

418

MEN01980

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

26

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
ALLEGAN	OTSEGO	¼ ¼ ¼	23	N/S.	E/W

Distance And Direction from Road Intersections: O' E. OF PLANT AND 80'N. OF RIVER.

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:

N / S / E / W — 1 MI. — 1 MILE

3 OWNER OF WELL MENASHA CORPORATION

Address: OTSEGO, MICHIGAN

4 WELL DEPTH (completed) 80 ft. Date of Completion 1-29-77

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☒ RC

6 USE. ☐ Domestic ☐ Public Supply ☒ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING. Threaded ☐ Welded ☒ Height: Above/Below Surface 2 ft.

Diam. 12 in. to 62 ft. Depth — Weight 51 lbs./ft.

____ in. to ____ ft. Depth — Drive Shoe? Yes ☐ No ☒

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
DIRTY SAND, GRAVEL	11	11
CLAY	15	26
FINE SAND	14	40
COURSE SAND	36	76
COURSE GRAVEL, BOULDERS	4	80
CLAY, BOULDERS	-	-

USE A 2ND SHEET IF NEEDED

8 SCREEN.

Type JOHNSON WW Dia.: 12" Slot/Gauze .030 Length 20' Set between 60 ft. and 80 ft.

Fittings:

9 STATIC WATER LEVEL 11 ft. below land surface

10 PUMPING LEVEL below land surface 41 ft. after 8 hrs. pumping 800 g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☒ Yes ☐ No ☐ Neat Cement ☒ Bentonite ☐

Depth: From 14 ft. to 54 ft.

14 Nearest Source of possible contamination ____ feet ____ Direction ____ Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☒ Not installed

Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[illegible] INC.

REGISTERED BUSINESS NAME — REGISTRATION NO

Address [illegible]

Signed [signature] AUTHORIZED REPRESENTATIVE — Date [illegible]

067d 100M (Rev. 12-68)

LOCAL HEALTH DEPT. COPY

WELL 32

GEOLOGICAL SURVEY SAMPLE No.

MEN01981

7

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

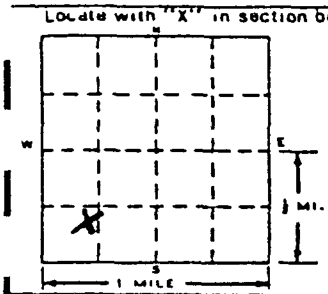
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	S.W. S.W. N.E.	13	1 N.	12 W.

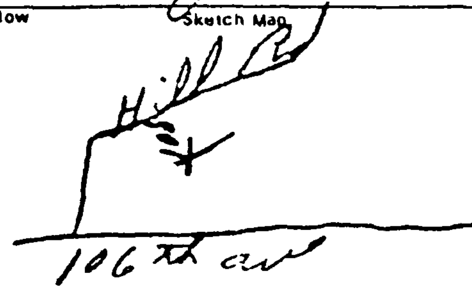
Distance And Direction from Road Intersections: 3/10 Mile East of 106th ave on Hill Rd

Street address & City of Well Location: 1372 Hill Rd Otsego, mich

Locate with "X" in section below



Sketch Map



3 OWNER OF WELL.

Owen L Vans

Address: 115 [illegible] St.
Otsego, mich 49078

4 WELL DEPTH: (completed)

53 ft. Date of Completion: June 5 - 72

5

☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE.

☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING.

Threaded ☒ Welded ☐

Diam.
2 in. to 49 ft. Depth
2 in. to 49 ft. Depth

Height, Above/~~Below~~ Surface 1 ft.
Weight 3.65 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand & Gravel	11'	11'
Sand & Gravel & Brown Clay	7'	18'
Blue Clay & Gravel	30'	48'
Fine & Coarse Sand	5'	53'

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: Stainless Dia.: 1 1/4"
Slot/~~Gauze~~ 10 Length 4'
Set between 49 ft. and 53 ft.
Fittings: 1-1 1/4" coupling

9 STATIC WATER LEVEL

23 ft. below land surface

10 PUMPING LEVEL below land surface

45 ft. after 1 hrs. pumping 10 g.p.m.
45 ft. after 1 hrs. pumping 10 g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Chlorides (Cl) NOT KNOWN

Hardness ______ Other ______

12 WELL HEAD COMPLETION:

☐ In Approved Pit
☐ Pitless Adapter ☒ 12" Above Grade

13

Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination

80 feet S.W. Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:

☒ Not installed

Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[illegible] Drilling — 0488

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 [illegible] St. [illegible]

Signed [illegible] Date June 5-72

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12 68)

WELL 23

LOCAL HEALTH DEPT. COPY

Otsego Twp. (Allegan County)

Charles W. Teater

Martindale # 1 Permit # 5995

Drilling Contractor: Company Tools.

Location: SW$\frac{1}{4}$ SW$\frac{1}{4}$ NW$\frac{1}{4}$ section 29, T.1N., R.12W.
330 feet from south and 330 feet from west line of quarter section.

Elevation: 836.7 feet above sea level.

Record by J. Akers from driller's log.

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
Drift	259	259
MISSISSIPPIAN:		
Coldwater:		
Shale, gray	236	495
Lime, gray	40	535
Shale, gray	285	820
Mud, red	3	823
Shale, gray	37	860
Red Rock	18	878
Ellsworth:		
Shale, green	297	1175
Lime shells	20	1195
Shale, green	30	1225
Shale, gray	65	1290
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, brown	110	1400 (1406 S.L.M.)
DEVONIAN:		
Traverse:		
Lime, broken	15	1415
Shale, gray	32	1447 (1454 S.L.M.)
Lime (Water 1500-1515)	68	1515
(Correction 1460 C.M. - 1466 S.L.M.)		
Total Depth		1515

Casing Record:
10" 122'
8$\frac{1}{4}$" 259'
Reduced Hole 1454'

Commenced: 4-23-39
Completed: 5-13-39
Initial Production: Dry Hole
Plugged and Abandoned: 5-15-39.

APR 16 1976

WATER WELL RECORD
ACT 294 PA 1965

M MEN01983 9

PUBLIC HEALTH

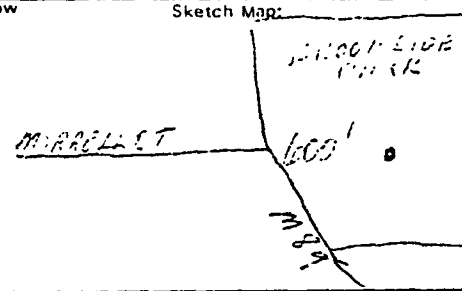
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	NE 1/4 SE 1/4 SE 1/4	23	1N N/S.	12W E/W.

Distance And Direction from Road Intersections
600 ft. NE of Road 89 & Morrell St.
In Brookside Park - Otsego, Mich.
Street address & City of Well Location

Locate with "X" in section below — 1 MI. — 1 MILE

Sketch Map:



3 OWNER OF WELL:
City of Otsego
Address: 117 East Orleans
Otsego, Michigan 49078

4 WELL DEPTH: (completed)
115 ' ft. Date of Completion July, 1975

5
☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE:
☐ Domestic ☒ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING:
Threaded ☐ Welded ☒
Diam. 16 in. to 85 ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface 1' above ft.
Weight ____ lbs./ft.
Drive Shoe? Yes ☐ No ☒

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Fill	0	5
Medium Sand	5	20
Soft Brown clay	20	22
Fine sand	22	36
Coarse sand and gravel	36	40
Coarse sand and gravel w/boulders	40	45
Medium sand and gravel	45	60
Coarse sand w/some gravel	60	95
Coarse sand w/boulders	95	113
Clay	113	115

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Stainless Steel Dia.: 12" P.S. ~~16" P.S.~~
Slot/Gauze 35 Length 30'
Set between 85 ft. and 115 ft.
Fittings: Welded

9 STATIC WATER LEVEL
12 ft. below land surface

10 PUMPING LEVEL below land surface
35 ft. after 2 hrs. pumping 1000 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION:
☐ In Approved Pit
☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted?
☒ Yes ☐ No
☒ Neat Cement ☐ Bentonite ☐ ____
Depth: From 0 ft. to 35 ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP:
☐ Not installed
Manufacturer's Name Deming
Serial Model Number T-75112 HP 40 Volts 460
Length of Drop Pipe 40 ft. capacity 600 G.P.M.
Type: ☐ Submersible
☐ Jet ☒ Reciprocating

16 Remarks, elevation, source of data, etc.
ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Dunbar Drilling Inc. 0161
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 307 Broadway, Swanton, Ohio 43558

Signed ____ Date 3-31-76
AUTHORIZED REPRESENTATIVE

067d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

1973

Layne NORTHERN COMPANY INCORPORATED

MEN01984 10

INDIANAPOLIS • MISHAWAKA • LANSING

☐ TEST
☒ PERMANENT

Job No. 16455

WELL LOG No. 4 CITY Otsego County Allegan

Owner City of Otsego Township Otsego

Section 23 T1N,R12W

Location State Michigan

From Land Description 800' East of Hwy 89, 500' East of City Limits, 200' SW of

From Street or Road Kal River & 300' NE of Well #3

FORMATION FOUND – DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Fill	0	14	14	
Fine Sand	14	20	6	12
Coarse Sand	20	31	11	12
Boulders & Gravel	31	46	15	12
Silty Sand	46	50	4	
Coarse Sand	50	84	34	12
Fine Sand	84	86	2	12
Coarse Sand & Gravel	86	90	4	12
Fine Sand	90	97	7	12
Coarse Sand	97	107	10	12
Coarse Sand - Gravel	107	120	13	12
Clay	120	121		

Hole 30" "Dia Drilled by: Cable Tool ____ Rotary ____ Jetting ____ Reverse Circ. x Bucket ____ Auger ____

Rotary Hole Grouted: Neat Cement x Drilling Mud ____ Other ____

Casing 30 "OD From 1 "above ground to 87 feet below ground. Weight 79.5 Pounds per foot

Screen 12" " Set from 95 to 120' feet Make Johnson Type WW Slot .035

Pumping test 1200 GPM drawdown to 52 feet after 8 hours pumping

0550

4-13-71 Paul Wyatt

GEOLOGICAL SURVEY SAMPLE No.

96

MEN01985

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

11

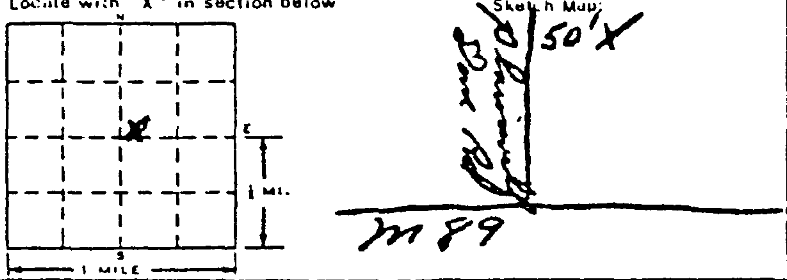
LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	NE. SW. SW.	24	1 N/S	12 E/W.

Distance And Direction from Road Intersections: 3/10 mile N of M 89 on Plainwell Dam Rd Plainwell Dam Rd Otsego, Mich

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL: Continental Ready Mix Concrete Co.

Address: Nazareth Rd Kalamazoo, mich

4 WELL DEPTH: (completed) 68 ft. Date of Completion Sept 7-72

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☒ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☒ Ready-mix plant

7 CASING: Threaded ☒ Welded ☐ Height: Above Surface 1 ft.

Diam. 4 in. to 58 ft. Depth, Weight 10.79 lbs./ft.

4 in. to 58 ft. Depth, Drive Shoe? Yes ☒ No ☐

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand & Gravel & Brown Clay	18'	18'
Sand & Gravel	50'	68'

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: Stainless Dia.: 3 1/2

Slot/Gauze 10 Length 8 1/2'

Set between 58 ft. and 68 ft.

Fittings: 1' of 3" casing / Rubber pack 17 1/4 Nipple inside

9 STATIC WATER LEVEL

32 ft. below land surface

10 PUMPING LEVEL below land surface

50 ft. after 1 hrs. pumping 80 g.p.m.

50 ft. after 1 hrs. pumping 80 g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Not Chloride (Cl) KNOWN

Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No

☐ Neat Cement ☐ Bentonite ☐ ______

Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination

85 feet N.E. Direction Septic Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☒ Not installed

Manufacturer's Name ______

Model Number ______ HP ___ Volts ______

Length of Drop Pipe ______ ft. capacity ____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Baker Well Drilling — 0488

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood St. Otsego, mich

Signed Rex Baker — AUTHORIZED REPRESENTATIVE — Date Sept 11-72

367d 100M (Rev. 12-68)

WELL 30

WATER WELL RECORD
ACT 294 PA 1965

MEN01986 · 12

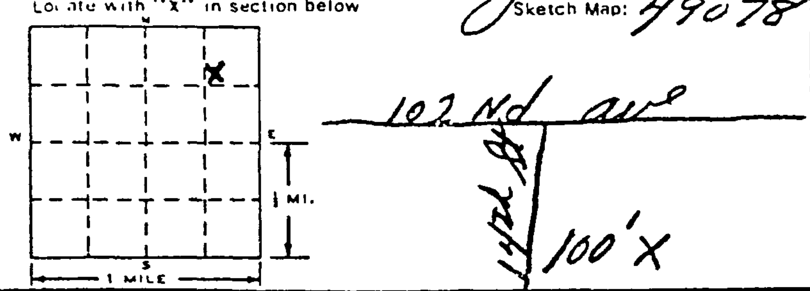
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
allegan	otsego	N.E.NE.SW	35	1 N/S	12 E/W.

Distance And Direction from Road Intersections: 1/10 mile S of 102 Nd ave on 14th St

Street address & City of Well Location: R#2 14th St otsego mich

Locate with "X" in section below — Sketch Map: 49078



3 OWNER OF WELL: Richard Hartman
Address: 120 E allegan St otsego, Mich

4 WELL DEPTH: (completed) 34 ft. Date of Completion: Sept 11-72

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Diam.
2 in. to 26' ft. Depth
1¼ in. to 38" ft. Depth
Height: Above/~~Below~~ Surface 1 ft.
Weight 3.75 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown clay	6'	6'
Blue clay	24'	30'
Sand & Gravel	4'	34'

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Stainless Dia.: 1¼"
Slot/~~Gauze~~ 10 Length 4'
Set between 30 ft. and 34 ft.
Fittings: 2 - 1¼" cuplings - 38" Set Link

9 STATIC WATER LEVEL
10 ft. below land surface

10 PUMPING LEVEL below land surface
20 ft. after 1 hrs. pumping 10 g.p.m.
20 ft. after 1 hrs. pumping 10 g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Not Chloride (Cl) Known
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
Septic tank ~~feet~~ ~~Direction~~ Not in yet Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☒ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc. 18.

ADDED INFO. BY DRILLER, ITEM NO 1

CORRECTED BY:

ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Bakers Well Drilling — 0488
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood St Otsego, Mich

Signed Rip Baker — AUTHORIZED REPRESENTATIVE — Date Sept 11-72

067d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Table 4-2

RESULTS OF CHEMICAL ANALYSIS OF

FIT-COLLECTED MONITORING WELL SAMPLES

Sample Collection Information and Parameters	Sample Number MW1	Duplicate	MW2	MW3	MW4	MW5	Blank
Date	6/26/90	6/26/90	6/26/90	6/26/90	6/26/90	6/26/90	6/26/90
Time	1215	1215	1105	1420	1430	0930	1200
CLP Organic Traffic Report Number	ELR64	ELR65	ELR66	ELR67	ELR68	ELR69	ELR70
CLP Inorganic Traffic Report Number	MELP55	MELP56	MELP57	MELP58	MELP59	MELP60	MELP61
Temperature (°C)	16	16	15	18	16	20	15
Specific Conductivity (μmhos/cm)	946	946	996	1,804	1,640	11.6	725
pH	7.31	7.31	7.46	7.22	7.07	6.20	7.32
Compound Detected (values in μg/L)							
Volatile Organics							
methylene chloride	—	—	—	10J	—	—	—
acetone	—	—	—	—	—	—	5J
carbon disulfide	—	—	—	—	—	—	6J
1,1,1-trichloroethane	—	—	—	8	—	—	—
trichloroethene	—	—	—	0.8J	—	—	—
Analyte Detected (values in μg/L)							
aluminum	—	—	—	394	—	—	—
arsenic	19.1	9.5B	14.5	156	8.9B	—	—
barium	120B	107B	121B	132B	191B	27.7B	—
calcium	8,530	77,700	74,100	76,300	72,400	86,300	310B
chromium	—	4.1BJ	—	16.4J	6.8BJ	—	4.4BJ
copper	—	—	30.6J	—	6.9BJ	—	—
iron	4,690	4,350	2,020	8,770	1,490	35.3BJ	12.88J
lead	2.3BJ	—	3.7J	7.2J	4.4J	3.2J	2BJ
magnesium	28,500	25,600	28,200	36,700	42,000	31,100	70.6B
manganese	152	142	226	86	728	24.8	—
nickel	—	—	—	—	12.4B	—	—

Table 4-2 (Cont.)

Sample Collection Information and Parameters	MW1	Duplicate	MW2	MW3	MW4	MW5	Blank
				Sample Number			
potassium	2,090B	1,920B	1,780B	11,100	19,200	1,360B	--
selenium	--	--	3.5BNWJ	--	--	--	--
sodium	23,900	21,300	67,300	300,000	302,000	4,290B	598B
vanadium	--	--	5.8B	51.2	13.5B	--	--
zinc	35.4J	47.4J	94J	55.3J	76.6J	97.3J	13BJ

-- Not detected.

NOTE: The analytical results for the semivolatile organic portions of samples MW2, MW3, MW4, and MW5 are unusable because holding times were exceeded.

Table 4-2 (Cont.)

COMPOUND QUALIFIER	DEFINITION	INTERPRETATION
J	Indicates an estimated value.	Compound value may be semiquantitative.

ANALYTE QUALIFIERS	DEFINITION	INTERPRETATION
N	Spike recoveries outside QC protocols, which indicates a possible matrix problem. Data may be biased high or low. See spike results and laboratory narrative.	Value may be quantitative or semi-quantitative.
B	Value is real, but is above instrument DL and below CRDL.	Value may be quantitative or semi-quantitative.
J	Value is above CRDL and is an estimated value because of a QC protocol.	Value may be semiquantitative.
W	Post-digestion spike for furnace AA analysis is out of control limits (35-115%), while sample absorbance is <50% of spike absorbance.	Value may be semiquantitative.

Table 4-3

RESULTS OF CHEMICAL ANALYSIS OF

FIT-COLLECTED SURFACE WATER SAMPLES

Sample Collection Information and Parameters	Sample Number SW1	Duplicate	SW2	SW3	SW4	Blank
Date	6/27/90	6/27/90	6/27/90	6/27/90	6/27/90	6/27/90
Time	0910	0910	0920	1100	1125	0900
CLP Organic Traffic Report Number	ELR71	ELR72	ELR73	EGK81	EGK82	EJW93
CLP Inorganic Traffic Report Number	MELP62	MELP63	MELP64	MEFQ35	MEFQ36	MEJW55
Temperature (°C)	20	20	30	31	21	18
Specific Conductivity (μmhos/cm)	599	599	2,860	5,860	821	5.1
pH	8.34	8.34	8.32	2.10	8.14	6.07
Compound Detected (values in μg/L)						
Volatile Organics						
methylene chloride	4J	6	6	–	4J	4J
Semivolatile Organics						
diethylphthalate	—	—	—	—	6J	—
bis(2-ethylhexyl)phthalate	—	—	7J	—	—	—
Analyte Detected (values in μg/L)						
aluminum	193B	181B	2,730	61.9B	302	—
arsenic	2.8B	2.5B	4.8B	6.2B	3.2B	—
barium	67B	67.4B	167B	91.7B	72.7B	—
calcium	81,800	83,000	74,500	74,200	80,400	9.5B
chromium	5.6BJ	6BJ	13.2J	4.4BJ	5.2BJ	4.4BJ
copper	6.3BJ	8.2BJ	26.8BJ	7.1BJ	6.4BJ	85.9
iron	648	716	1,420	1,010	886	19.4BJ
lead	8.1J	16.9J	12WJ	17J	7.8J	—
magnesium	23,200	23,500	23,600	25,400	23,300	—
manganese	79.5	78.5	257	137	94.7	1.3BJ

Table 4-3 (Cont.)

Sample Collection Information and Parameters	Sample Number: SW1	Duplicate	SW2	SW3	SW4	Blank
mercury	—	—	0.28	—	—	—
potassium	2,260B	2,270B	28,900	2,260B	2,380B	—
selenium	—	—	3.3BNWJ	—	3.1BNJ	—
sodium	27,700	28,100	464,000	42,500	28,700	139B
vanadium	—	—	13.1B	—	—	—
zinc	14.4BJ	38.8J	59.6J	12.8BJ	21.8J	30.3J

– The analytical results for the volatile organic portion of sample SW3 are unusable because holding times were exceeded.

— Not detected.

Table 4-3 (Cont.)

COMPOUND QUALIFIER	DEFINITION	INTERPRETATION
J	Indicates an estimated value.	Compound value may be semiquantitative.

ANALYTE QUALIFIERS	DEFINITION	INTERPRETATION
N	Spike recoveries outside QC protocols, which indicates a possible matrix problem. Data may be biased high or low. See spike results and laboratory narrative.	Value may be quantitative or semi-quantitative.
B	Value is real, but is above instrument DL and below CRDL.	Value may be quantitative or semi-quantitative.
J	Value is above CRDL and is an estimated value because of a QC protocol.	Value may be semiquantitative.
W	Post-digestion spike for furnace AA analysis is out of control limits (35-115%), while sample absorbance is <50% of spike absorbance.	Value may be semiquantitative.

5. DISCUSSION OF MIGRATION PATHWAYS

5.1 INTRODUCTION

This section presents discussions of data and information pertaining to potential migration pathways and targets of TCL compounds and TAL analytes that are possibly attributable to the MC site.

The five migration pathways of concern discussed are groundwater, surface water, air, fire and explosion, and direct contact.

5.2 GROUNDWATER

Arsenic (156 μg/L) was detected above background level in the groundwater sample collected from monitoring well MW3. Although arsenic cannot be directly attributed to the site because it was not detected in on-site soil samples at concentrations significantly above background level, it appears that arsenic may be potentially attributable to the site because it is used in Menasha Corporation manufacturing processes and well MW3 is a downgradient well (CH2M Hill 1981).

A potential exists for TCL compounds and TAL analytes detected in on-site soil to migrate to groundwater in the vicinity of the MC site, based on the following information.

- TCL compounds and TAL analytes were detected in on-site soil samples, including mercury (7.9NJ mg/kg), toluene (91J μg/kg), and carbon disulfide (15J μg/kg) in soil sample S7 and beryllium (7.6 mg/kg) and copper (416 mg/kg) in soil sample S2 (see Table 4-1 for definitions and interpretations of qualifiers).

- The on-site landfill is not lined.

- Ash has been deposited in the on-site landfill.

- The contents of the former emergency spent liquor pond were alleged to have leached into the groundwater and contaminated two municipal wells and several nearby residential wells.

Some of the volatile organic results from the groundwater samples may have been low because of the excessive bubbling of the water from which the sample was collected.

The geology of the area of the MC site is extensively glaciated. The site is underlain by unconsolidated material, which is composed of glacial drift deposits that extend approximately 250 feet below ground surface in this area (see Appendix E for logs of area wells). The glaciated deposits consist of glacial outwash and moraines made up of glacial till, silt, clay lenses, gravel and boulders, and lenses of sands, gravels, silts, clays, and tills (Western Michigan University [WMU] 1981; CH2M Hill 1981). The glacial material overlies a Coldwater Shale bedrock of Mississippian age (WMU 1981).

Municipal wells and residential wells within a 3-mile radius of the site draw drinking water from the sand and gravel layers in the glacial drift at depths ranging from 33.78 to 220 feet (see Appendix E). Based on area well logs, there does not appear to be a continuous confining layer throughout a 3-mile radius of the site separating the individual water-bearing layers. Therefore, these layers are considered to be hydraulically connected and together form the aquifer of concern (AOC). The depth to groundwater on-site was determined by FIT to be 46.50 feet. The depth to the AOC at the site, therefore, is 46.50 feet. However, the depth to the AOC can be as shallow as 33.78 feet in other areas in the vicinity of the site.

All municipal wells and private wells are screened in the AOC. The nearest municipal well is located approximately 1/2 mile from the site; the nearest private well is located 1/4 mile from the site. The groundwater flow direction in the area of the site was determined to be west-southwest, toward the Kalamazoo River (CH2M Hill 1981).

The potential targets of groundwater contamination include the approximately 12,239 persons supplied by drinking water from municipal wells and private wells within a 3-mile radius of the site. Of this population, 5,000 persons obtain drinking water from the city of Otsego's three municipal wells. All of Otsego's municipal wells are located within a 3-mile radius of the site; water from the wells is blended prior to distribution (Krogmann 1987; Tice 1986). There are 4,502 persons that obtain drinking water from the city of Plainwell's three municipal wells. Two of these municipal wells are located within a 3-mile radius of the site; water from all three wells is blended prior to distribution (Michigan Department of Public Health 1987).

The number of persons who obtain drinking water from private wells within a 3-mile radius of the site in Allegan and Kalamazoo counties was calculated by counting houses on United States Geological Survey (USGS) topographic maps of the area (USGS 1967, 1967a, 1981, 1981a, 1982, 1982a) and multiplying by a value of 2.95 persons per household for Allegan County and a value of 2.87 persons per household for Kalamazoo County (U.S. Bureau of the Census 1982). This calculation yields a total population of 2,737 persons within a 3-mile radius of the site who use private wells.

5.3 SURFACE WATER

Aluminum was detected in a surface water sample collected at the site and it appears to be attributable to the MC site, based on the following information.

- Aluminum was detected above background level in surface water sample SW2, collected from Outfall 003.

- The Menasha Corporation NPDES permit does not cover aluminum.

A potential exists for additional TCL compounds and TAL analytes to migrate to surface water via surface water runoff from the site and through discharge from the outfalls at the site, based on the following information.

- Surface water runoff from the site can reach the adjacent Kalamazoo River via overland migration.
- Noncontact cooling water is discharged from the on-site facility into the Kalamazoo River.
- On October 11, 1985, Menasha Corporation collected samples from outfalls 002 and 003. Results from the sample collected at Outfall 002 revealed 1,2-dichloroethane at 36 µg/L and bromoform at 33 µg/L.
- On September 15 and 16, 1986, MDNR sampled all of the MC site's outfalls. Samples from outfalls 002 and 003 revealed 1,2-dichloroethane and bromoform, and sample results from Outfall 000 revealed high concentrations of total metals.
- In the past, Menasha Corporation has been found in violation of its NPDES permit (MDNR 1978).
- High levels of total organic vapors (up to 1,000 ppm) were detected in the weir house for Outfall 000 during the SSI.

Some of the volatile organic results from surface water samples may be low because of the excessive bubbling of the water from which the sample was collected.

No population within 3 miles downstream of the site receives drinking water from surface water (Michigan Department Public Health 1987). The Kalamazoo River is used for recreational purposes. The target population for surface water is not known.

5.4 AIR

A release of TCL compounds or TAL analytes to the air was not documented during the SSI of the MC site. During the reconnaissance inspection, the FIT site-entry instrument OVA 128 detected up to 1,000 ppm above background levels inside the weir house for Outfall 000. The explosimeter, oxygen meter, hydrogen cyanide monitor, and radiation monitor not detect levels above background concentrations at the site. In accordance with the U.S. EPA-approved work plan, further air monitoring was not conducted by FIT.

A low potential does exist for TCL compounds and TAL analytes to migrate from the site via windblown particulates, because TCL compounds and a TAL analyte were detected in on-site surface soil/sediment samples. However, most of the site is vegetated.

The population within a 4-mile radius of the site potentially affected by a release of TCL compounds and TAL analytes to the air is approximately 13,022 persons. The population was calculated by counting 1,854 houses within a 4-mile radius of the site on USGS topographic maps (USGS 1967, 1967a, 1981, 1981a, 1982, 1982a) and multiplying this figure by a 2.95 persons-per-household average for Allegan County and a 2.87 persons-per-household average for Kalamazoo County (U.S. Bureau of the Census 1982), yielding a total population of 5,469 persons within a 4-mile radius of the site and outside the municipal boundaries of Otsego and Plainwell. The population of Otsego is 3,802 persons, and the population of Plainwell is 3,751 persons. By adding these figures to 5,469, a total air target population of 13,022 persons was calculated.

5.5 FIRE AND EXPLOSION

According to federal, state, and local file information reviewed by FIT and an interview with the fire chief of the Otsego Fire Department, no documentation exists of an incident of fire or explosion at the site (Zantello 1987). According to FIT observations and site-entry equipment readings, no potential for fire or explosion existed at the site at the time of the SSI

5.6 DIRECT CONTACT

According to federal, state, and local file information reviewed by FIT, observations made during the SSI, and the interview with the site representatives, no incidents of direct contact with TCL compounds or TAL analytes at the MC site have been documented. However, there is a potential that the public may come into direct contact with TCL compounds and TAL analytes at the site, based on the following information.

- Access to the site is not restricted; no security guard or other means of security are used at the site (Kling et al. 1990).

- TCL compounds and TAL analytes were detected in on-site soil/sediment samples and surface water samples.

- Two municipal wells and nearby residential wells were alleged to have been contaminated by wastes seeping from a pond on-site.

The population within a 1-mile radius of the site potentially affected through direct contact with TCL compounds and TAL analytes at the site is 3,996 persons. This population was calculated by counting 66 houses within a 1-mile radius of the site on a USGS topographic map (USGS 1967) and multiplying this number by a persons-per-household value of 2.95 (U.S. Bureau of the Census 1982), yielding a total population of 194 persons within a 1-mile radius of the site and outside the municipal boundaries of the city of Otsego.

This figure was added to the population figure for the portion of the city of Otsego within a 1-mile radius of the site (3,802). The total direct contact target population consists of 3,996 persons.

6. REFERENCES

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CH2M Hill, April 1981, Sanitary Landfill Hydrogeologic Investigation, for Menasha Corporation, Otsego, Michigan.

E & E, 1987, Quality Assurance Project Plan Region V FIT Conducted Site Inspections, Chicago, Illinois.

Kling, Keith, October 4, 1990, Environmental Director, Menasha Corporation, telephone conversation, contacted by Randy Livingston of E & E.

__________, October 22, 1990a, Environmental Director, Menasha Corporation, telephone conversation, contacted by Randy Livingston of E & E.

Kling, Keith, John R. Blauwkamp, Len Myers, and John Bonham, June 25, 1990, Environmental Director, Senior Environmental Engineer, Environmental Technician, and Engineering and Technical Service Manager, respectively, for Menasha Corporation, site representative interview, conducted by Randy Livingston of E & E.

Krogmann, John, June 25, 1987, Assistant Superintendent, Otsego Department of Public Works, telephone conversation, contacted by Randy Livingston of E & E.

MDNR, December 3, 1978, Potential Ground Water Contamination Source Identification and Preliminary Assessment, prepared for Menasha Corporation, Otsego, Michigan.

_________, May 31, 1985, Menasha Corporation application for an NPDES permit, submitted to Fred Morley, District Supervisor, MDNR, Plainwell District.

_________, March 14, 1986, Potential Hazardous Waste Site Preliminary Assessment, for the MC site, U.S. EPA ID: MID006012405, prepared by Cheryl Wallace, Groundwater Quality Division, MDNR, Site Assessment Unit, Lansing, Michigan.

_________, September 15 and 16, 1986a, report, Industrial Wastewater Survey, conducted at the MC site, prepared by the Environmental Protection Bureau Point Source Monitoring Section.

_________, April 18, 1988, Surface Water Division Point Source Monitoring, report, Industrial Wastewater Survey, conducted at the MC site, Paperboard Division, Otsego, Michigan.

Michigan Department of Public Health, November 6, 1987, Water Supply Services Division, Community Public Water Supply, Summary Report.

Tice, Jane, April 2, 1986, City Manager's office, Otsego, Michigan, telephone conversation, contacted by Pam Woodhouse of E & E.

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U.S. EPA, February 12, 1988, Office of Solid Waste and Emergency Response, Pre-Remedial Strategy for Implementing SARA, Directive number 9345.2-01, Washington, D.C.

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__________, 1981, Allegan, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

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__________, 1982, Martin, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

__________, 1982a, Orangeville, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

WMU, 1981, Hydrogeologic Atlas of Michigan, Department of Geology, Kalamazoo, Michigan.

Zantello, Gary, June 25, 1987, Fire Chief, Otsego Fire Department, telephone conversation, contacted by Randy Livingston of E & E.

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APPENDIX A

SITE 4-MILE RADIUS MAP

APPENDIX B

U.S. EPA FORM 2070-13

MEN02004

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Menasha Corporation	320 North Farmer Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Otsego	MI	49078	Allegan	05	04

09 COORDINATES: LATITUDE 42 27 45.0 / LONGITUDE 085 41 10.0

10 TYPE OF OWNERSHIP (Check one): ■ A. PRIVATE ☐ B. FEDERAL ______ ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ______ ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION (MONTH DAY YEAR)	02 SITE STATUS	03 YEARS OF OPERATION
6/25-27/90	■ ACTIVE ☐ INACTIVE	1939 (BEGINNING YEAR) / Present (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A. EPA ■ B. EPA CONTRACTOR E.&E., INC. (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ______ (Name of firm)

☐ E. STATE ☐ F. STATE CONTRACTOR ______ (Name of firm) ☐ G. OTHER ______ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO
Randy Livingston	Geographer	E.&E., INC.	(312) 663-9415

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO
Bill Schaefer	Environmental Engineer	E.&E., INC.	(312) 663-9415
Cindy Schultz	Environmental Health Specialist	E.&E., INC.	(312) 663-9415
Scott Turek	Geologist	E.&E., INC.	(312) 663-9415
Ray Whitlock	Chemist	E.&E., Inc	(312) 663-9415
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
Keith Kling	Environmental Director	320 N. Farmer St. Otsego, MI 49078	(616) 692-6141
John R. Banwkamp P.E.	Senior Environ. Engineer	Box 367 Neenah, WI	(414) 751-1991
Len Myers	Environmental Technican	320 N. Farmer St. Otsego, MI 49078	(616) 692-6141
John Bonhan	Engineering & Tech. Service Manager	320 N. Farmer St Otsego, MI 49078	(616) 692-6141
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
■ PERMISSION ☐ WARRANT	1300/0800/0800	Sunny, partly Cloudy ~75°F / ~70°F overcast rain / Sunny Partly Cloudy ~69-80°F.

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Larry Thornton	Michigan Dept. of Natural Resources	(517) 275-5151

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE (MONTH DAY YEAR)
Randy Livingston	U.S. EPA Region V	E.&E. Inc.	(312) 663-9415	10, 6, 90

EPA FORM 2070-13 (7-81)

MEN02005

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ■ A. SOLID
- ☐ B. POWDER, FINES
- ■ C. SLUDGE
- ☐ D. OTHER ________ (Specify)
- ☐ E. SLURRY
- ■ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS ________

CUBIC YARDS UNKNOWN

NO. OF DRUMS ________

03 WASTE CHARACTERISTICS (Check all that apply)

- ■ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ■ D. PERSISTENT
- ■ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			REFER TO TABLES
PSD	PESTICIDES			4-1, 4-2 AND 4-3
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION

See TABLE 4-1 for chemical analysis of soil and sediment samples collected by FIT on June 26 + 27, 1990, Summary Sheet.

See TABLE 4-2 for chemical analysis of monitoring well samples collected by FIT on June 26, 1990, Summary sheet.

See TABLE 4-3 for Chemical analysis of surface water samples collected by FIT on June 27, 1990, Summary Sheet.

V. FEEDSTOCKS (See Appendix for CAS Numbers) NA

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Ecology and Environment Inc., FIT, Site reconnaisance inspection from June 25-27, 1990

Michigan Department of Natural Resources files.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 12,239
02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.2 OF NARRATIVE.

01 ■ B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 0
02 ■ OBSERVED (DATE: 6/27/90) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.3 OF NARRATIVE.

01 ■ C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED: 13,022
02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.4 OF NARRATIVE.

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED: NA
02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.5 OF NARRATIVE.

01 ■ E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED: 3,996
02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.6 OF NARRATIVE.

01 ■ F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: UNKNOWN (Acres)
02 ■ OBSERVED (DATE: June 26-27/90) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE TABLE 4-1 ANALYTICAL SUMMARY.

01 ■ G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 12,239
02 ■ OBSERVED (DATE: 1974) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5.2 OF NARRATIVE.

01 ■ H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: 220
02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 2.3 OF NARRATIVE.

01 ■ I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: 13,022
02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

SEE SECTION 5 OF NARRATIVE.

MEN02007

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ■ J. DAMAGE TO FLORA — 02 ■ OBSERVED (DATE: 6/25-27/90) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Areas of stressed vegetation were observed around the aeration pond on-site.

01 ■ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

NONE OBSERVED OR DOCUMENTED. A potential exists for damage to fauna to occurr through the ingestion of contaminated flora

01 ■ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED. SEE J. & K. ABOVE. A potential exists through the bioaccumilation of Contaminants.

01 ■ M. UNSTABLE CONTAINMENT OF WASTES (Spills/Runoff/Standing liquids, Leaking drums) — 02 ■ OBSERVED (DATE: 1974) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12,239 — 04 NARRATIVE DESCRIPTION

The emergency storage spent liquor pond content had seeped into the groundwater resulting in contaminating two municipal wells and several residential wells

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

N/A

III. TOTAL POPULATION POTENTIALLY AFFECTED: 13,022

IV. COMMENTS

NONE.

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Ecology and Environment Inc., FIT site interview 6/25/90 and inspection 6-25-27-90.
E. & E. Inc. FIT Files, Michigan Dept. of Natural Resources files.
U.S.G.S Topograph Maps.

MEN02008

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
■ A. NPDES	MI0003824	5/21/85	5/31/90	Now operating with interim permit
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
■ I. OTHER (Specify) Groundwater	MI0000333	3/31/85	3/31/90	operating with interim permit.
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
■ F. LANDFILL - Closed	UNKNOWN	UNKNOWN
☐ G. LANDFARM		
☐ H. OPEN DUMP		
■ I. OTHER 6 ponds (Specify)	on-site	UNKNOWN

04 TREATMENT (Check all that apply)

- ■ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ■ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ■ G. OTHER RECYCLING/RECOVERY Ash
- ☐ H. OTHER ______ (Specify)

05 OTHER

- ■ A. BUILDINGS ON SITE 6

06 AREA OF SITE

90 (Acres)

07 COMMENTS

SEE SECTIONS 2.3 and 3.3 OF NARRATIVE.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ■ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

The One large aeration pond and the Two Settling ponds are not lined. The large aeration pond has cement bottom and sides.
The landfill is not lined.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ■ YES ☐ NO

02 COMMENTS

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Ecology and Environment Inc., FIT Site interview and inspection 6-25-27-90.
E. & E. Inc., FIT Files, Michigan Dept. of Natural Resources files.

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: MI
02 SITE NUMBER: D006012405

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL	ENDANGERED	AFFECTED	MONITORED	DISTANCE TO SITE
COMMUNITY	A. ☐	B. ■	A. ☐	B. ☐	C. ■	A. .50 (mi)
NON-COMMUNITY	C. ☐	D. ■	UNKNOWN D. ☐	E. ☐	F. ☐	B. ~.25 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

■ A. ONLY SOURCE FOR DRINKING
☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 12,239

03 DISTANCE TO NEAREST DRINKING WATER WELL .25+ .50 (mi)

04 DEPTH TO GROUNDWATER 46.50 (ft)

05 DIRECTION OF GROUNDWATER FLOW west Southwest

06 DEPTH TO AQUIFER OF CONCERN 46.50 (ft)

07 POTENTIAL YIELD OF AQUIFER UKNOWN (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ■ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

SEE SECTION 5.2 OF NARRATIVE.

10 RECHARGE AREA
■ YES ☐ NO
COMMENTS Percolation thru sandy soils recharges. Also the river in the area could Provide recharge to the groundwater system

11 DISCHARGE AREA
■ YES ☐ NO
COMMENTS The groundwater below the site is likely to discharge to the Kalamazoo river.

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

■ A. RESERVOIR, RECREATION DRINKING WATER SOURCE
☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES
☐ C. COMMERCIAL, INDUSTRIAL
☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Kalamazoo river	■	0 Ft ~~(mi)~~
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 3,996 NO. OF PERSONS	B. 6,727 NO. OF PERSONS	C. 12,092 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 50 Ft ~~(mi)~~

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 2,280

04 DISTANCE TO NEAREST OFF-SITE BUILDING 50 Ft. ~~(mi)~~

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Population within the vicinity of the site is sparsely populated.

MEN02010

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE *(Check one)*

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ■ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK *(Check one)*

☐ A. IMPERMEABLE *(Less than 10^{-6} cm/sec)* ■ B. RELATIVELY IMPERMEABLE *($10^{-4} - 10^{-6}$ cm/sec)* ☐ C. RELATIVELY PERMEABLE *($10^{-2} - 10^{-4}$ cm/sec)* ☐ D. VERY PERMEABLE *(Greater than 10^{-2} cm/sec)*

03 DEPTH TO BEDROCK: 90 (ft)

04 DEPTH OF CONTAMINATED SOIL ZONE: UNKNOWN (ft)

05 SOIL pH: UNKNOWN

06 NET PRECIPITATION: 3.20 (in)

07 ONE YEAR 24 HOUR RAINFALL: 2.2 (in)

08 SLOPE — SITE SLOPE: 20 % — DIRECTION OF SITE SLOPE: South — TERRAIN AVERAGE SLOPE: 10 %

09 FLOOD POTENTIAL — SITE IS IN NA YEAR FLOODPLAIN

10 NA ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS *(5 acre minimum)*

ESTUARINE A. NA (mi) OTHER B. Adjacent (mi)

12 DISTANCE TO CRITICAL HABITAT *(of endangered species)*

NA (mi)

ENDANGERED SPECIES: NA

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS PRIME AG LAND	AG LAND
A. 50 Ft ~~(mi)~~	B. 50 Ft ~~(mi)~~	C. NA (mi)	D. ~ 400 Ft. ~~(mi)~~

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

SEE APPENDIX A.

VII. SOURCES OF INFORMATION *(Cite specific references, e.g., state files, sample analysis, reports)*

Uncontrolled Hazardous Waste Site Ranking System Manual - Federal Register, 7-16-82.
U.S.G.S., Topographic Maps; Merson, Martin and Otsego, Michigan, Quads, 7.5 min. series.
E. + E. Inc., FIT site inspection 6-25-27-90.
Characteristics of Population, Number of Inhabitants, Michigan, 1980, Census of Population,
U.S. Dept. of Commerce Bureau of the Census.

EPA FORM 2070-13 (7-81)

MEN02011

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	7		
SURFACE WATER	6		
WASTE			
AIR		SEE SECTIONS 3(3.4) + 4	
RUNOFF			
SPILL			
SOIL / Sediment	10		
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
	Detected 800ppm - 1,000ppm inside of weir house #000.
OVA 128	Detected .5ppm above background on site.
Explosimeter	0 % LEL
Monitox	0ppm
O_2 Meter	No Reading above or below background detected.
Radiation Alert	No Reading above .1 MRem/Hr. detected.

IV. PHOTOGRAPHS AND MAPS

01 TYPE ■ GROUND ☐ AERIAL

02 IN CUSTODY OF E. + E., INC., FIT, Region V, Chicago, IL
(Name of organization or individual)

03 MAPS ■ YES ☐ NO

04 LOCATION OF MAPS E. + E., INC., FIT, Region V, Chicago, IL

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

PH
Conductivity
Temperature
SEE TABLE 4-2.

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E. + E., INC., FIT Site inspection 4/9th + 10th/1990.

MEN02012

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. CURRENT OWNER(S) / PARENT COMPANY (If applicable)

01 NAME: Menasha Corporation		02 D+B NUMBER:		08 NAME:		09 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.): 320 N. Farmer Street		04 SIC CODE:		10 STREET ADDRESS (P O Box, RFD #, etc.):		11 SIC CODE:	
05 CITY: Otsego	06 STATE: MI	07 ZIP CODE: 49078		12 CITY:	13 STATE:	14 ZIP CODE:	
01 NAME:		02 D+B NUMBER:		08 NAME:		09 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:		10 STREET ADDRESS (P O Box, RFD #, etc.):		11 SIC CODE:	
05 CITY:	06 STATE:	07 ZIP CODE:		12 CITY:	13 STATE:	14 ZIP CODE:	
01 NAME:		02 D+B NUMBER:		08 NAME:		09 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:		10 STREET ADDRESS (P O Box, RFD #, etc.):		11 SIC CODE:	
05 CITY:	06 STATE:	07 ZIP CODE:		12 CITY:	13 STATE:	14 ZIP CODE:	
01 NAME:		02 D+B NUMBER:		08 NAME:		09 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:		10 STREET ADDRESS (P O Box, RFD #, etc.):		11 SIC CODE:	
05 CITY:	06 STATE:	07 ZIP CODE:		12 CITY:	13 STATE:	14 ZIP CODE:	

III. PREVIOUS OWNER(S) (List most recent first) / IV. REALTY OWNER(S) (If applicable, list most recent first)

01 NAME: David Greene		02 D+B NUMBER:		01 NAME:		02 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.): P.O. Box 155		04 SIC CODE:		03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:	
05 CITY: Otsego	06 STATE: MI	07 ZIP CODE: 49078		05 CITY:	06 STATE:	07 ZIP CODE:	
01 NAME: George Bardeen Paper Mill		02 D+B NUMBER:		01 NAME:		02 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.): P.O. Box 155		04 SIC CODE:		03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:	
05 CITY: Otsego	06 STATE: MI	07 ZIP CODE: 49078		05 CITY:	06 STATE:	07 ZIP CODE:	
01 NAME:		02 D+B NUMBER:		01 NAME:		02 D+B NUMBER:	
03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:		03 STREET ADDRESS (P O Box, RFD #, etc.):		04 SIC CODE:	
05 CITY:	06 STATE:	07 ZIP CODE:		05 CITY:	06 STATE:	07 ZIP CODE:	

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E. + E., Inc., FIT site interview 6/25/90.
E. + E., Inc. FIT Files
MDNR Files.

MEN02013

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. CURRENT OPERATOR (Provide if different from owner)

Field	Value
01 NAME	Menasha Corporation
02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	320 N. Farmer Street
04 SIC CODE	
05 CITY	Otsego
06 STATE	MI
07 ZIP CODE	49078
08 YEARS OF OPERATION	1939 to Present
09 NAME OF OWNER	Menasha Corporation

OPERATOR'S PARENT COMPANY (If applicable) NA

Field	Value
10 NAME	
11 D+B NUMBER	
12 STREET ADDRESS (P.O. Box, RFD #, etc.)	
13 SIC CODE	
14 CITY	
15 STATE	
16 ZIP CODE	

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE	08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD
Otsego Falls Paper Mills		320 N. Farmer Street		Otsego	MI	49078	1934 - 1939	David Greene
Bardeen Paper Mill		P.O. Box 155		Otsego	MI	49078	1887 - 1934	George Bardeen

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable) NA

10 NAME	11 D+B NUMBER	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E.+E., Inc., FIT Site interview 6/25/90.
E.+E., Inc., FIT Files.
MDNR Files.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. ON-SITE GENERATOR

01 NAME: Menasha Corporation		02 D+B NUMBER:	
03 STREET ADDRESS (P.O. Box, RFD #, etc.): 320 N. Farmer Street		04 SIC CODE:	
05 CITY: Otsego	06 STATE: MI	07 ZIP CODE: 49078	

III. OFF-SITE GENERATOR(S) NA

01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME: Menasha Corporation		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.): 320 N. Farmer Street		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY: Otsego	06 STATE: MI	07 ZIP CODE: 49078	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E.&E. Inc., FIT Site interview 6/25/90.
E.&E. Inc., FIT Files.
MDNR Files.

MEN02015

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA SEE SECTION 2.3

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA SEE SECTION 2.3

01 ☐ D. SPILLED MATERIAL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ■ E. CONTAMINATED SOIL REMOVED 02 DATE 1985 03 AGENCY Menasha Corp.
04 DESCRIPTION Contaminated soils were excavated from on-site ponds and transported to a Type II Landfill off-site.

01 ☐ F. WASTE REPACKAGED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
UNKNOWN

01 ■ G. WASTE DISPOSED ELSEWHERE 02 DATE 1985 03 AGENCY Menasha Corp.
04 DESCRIPTION The contaminated soils were transported to a Type II Landfill off-site.

01 ☐ H. ON SITE BURIAL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ I. IN SITU CHEMICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ J. IN SITU BIOLOGICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ K. IN SITU PHYSICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ L. ENCAPSULATION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ M. EMERGENCY WASTE TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ N. CUTOFF WALLS 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ P. CUTOFF TRENCHES/SUMP 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Q. SUBSURFACE CUTOFF WALL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D00 6012405

II PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ S. CAPPING/COVERING — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ T. BULK TANKAGE REPAIRED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ U. GROUT CURTAIN CONSTRUCTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ V. BOTTOM SEALED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ W. GAS CONTROL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ X. FIRE CONTROL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Y. LEACHATE TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Z. AREA EVACUATED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 1. ACCESS TO SITE RESTRICTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 2. POPULATION RELOCATED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 3. OTHER REMEDIAL ACTIVITIES NA — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
SEE SECTION 2.3.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E. & E. Inc., FIT site interview 6/25/90
E. & E. Inc., FIT Files.
MDNR Files.

MEN02017

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D00060R405

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ■ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

SEE SECTION 2.3

III. SOURCES OF INFORMATION *(Cite specific references, e.g., state files, sample analysis, reports)*

E. + E. Inc., FIT, Site interview 6/25/90.
E. + E. Inc., FIT, Files.
MDNR Files.

EPA FORM 2070-13 (7-81)

APPENDIX C

FEIT SITE PHOTOGRAPHS

MEN02019

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 1 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

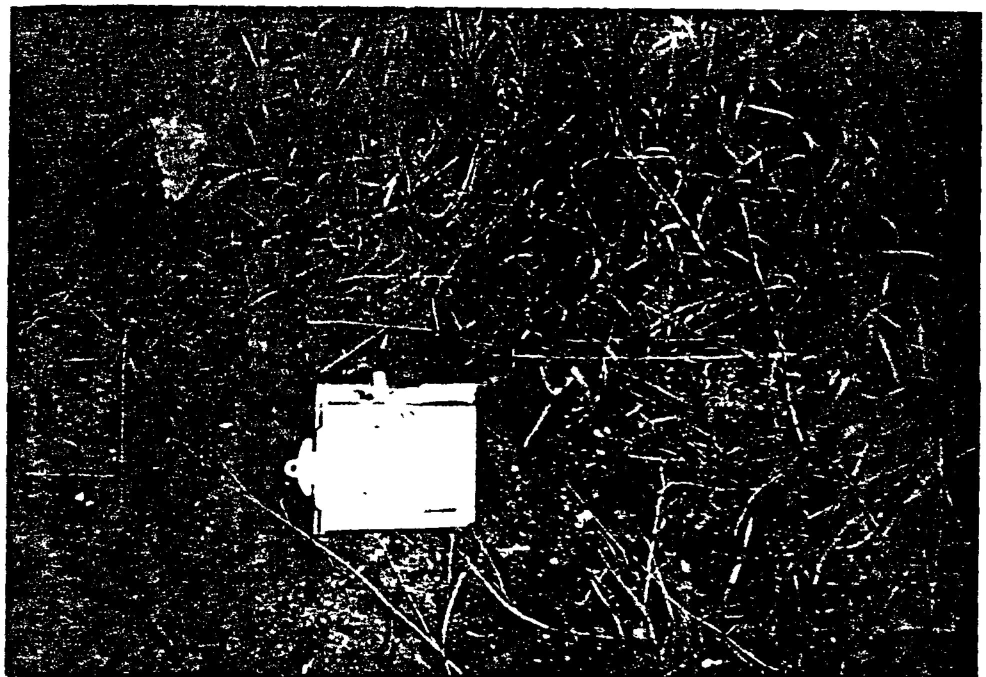
TIME: 1540

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S1



DESCRIPTION: This photograph shows soil sample S1 closeup.

DATE: 6/26/90

TIME: 1540

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S1

DESCRIPTION: This photograph shows soil sample S1 distant.

MEN02020

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 2 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

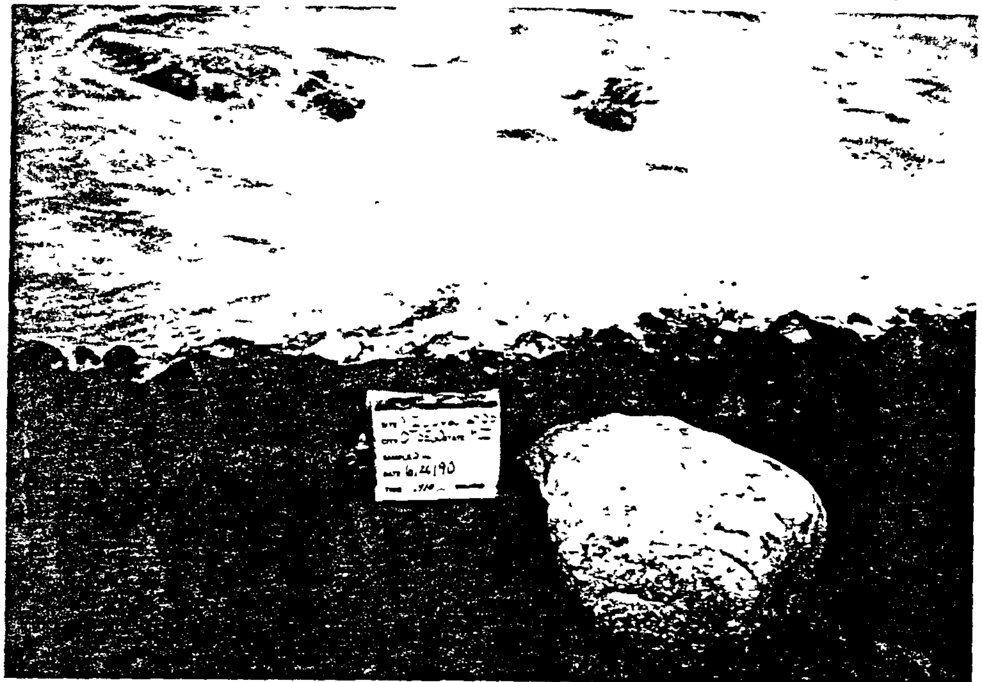
TIME: 1535

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S2



DESCRIPTION: This photograph shows soil sample S2 close up.

DATE: 6/26/90

TIME: 1535

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S2

DESCRIPTION: This photograph shows soil sample S2 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 3 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

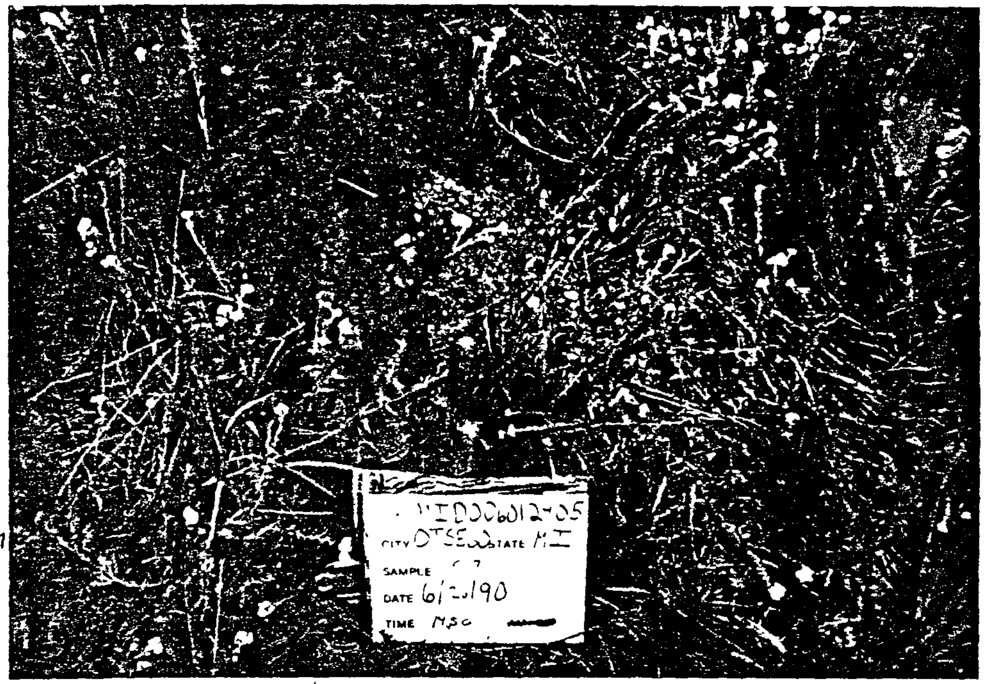
TIME: 1450

DIRECTION OF PHOTOGRAPH: Northwest

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S3



DESCRIPTION: This photograph shows soil sample S3 close up.

DATE: 6/26/90

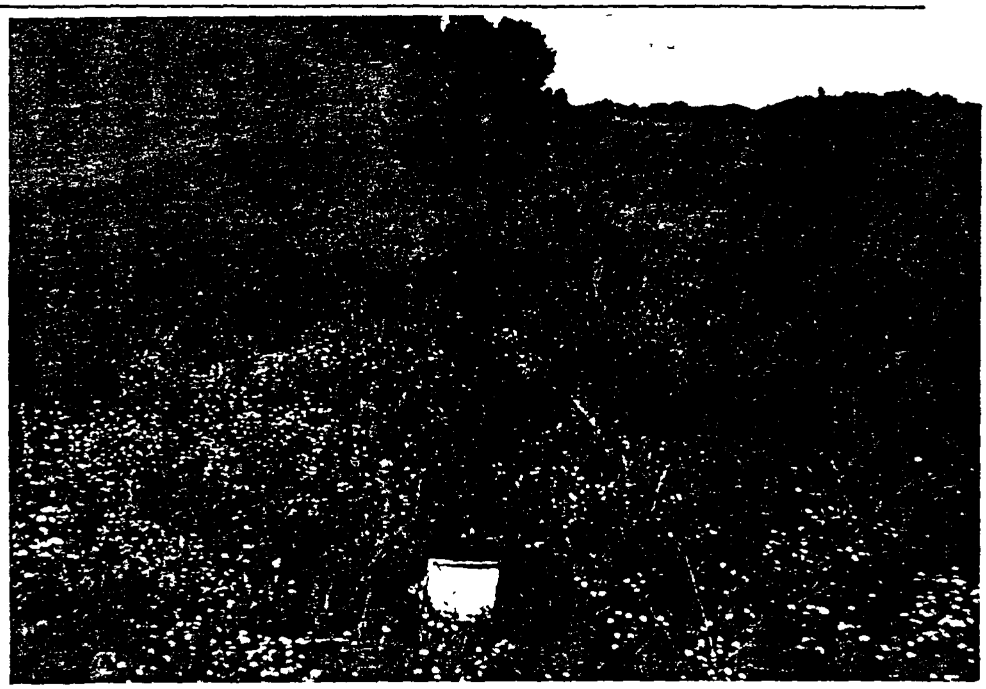
TIME: 1450

DIRECTION OF PHOTOGRAPH: Northwest

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S3



DESCRIPTION: This photograph shows soil sample S3 distant.

MEN02022

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 4 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

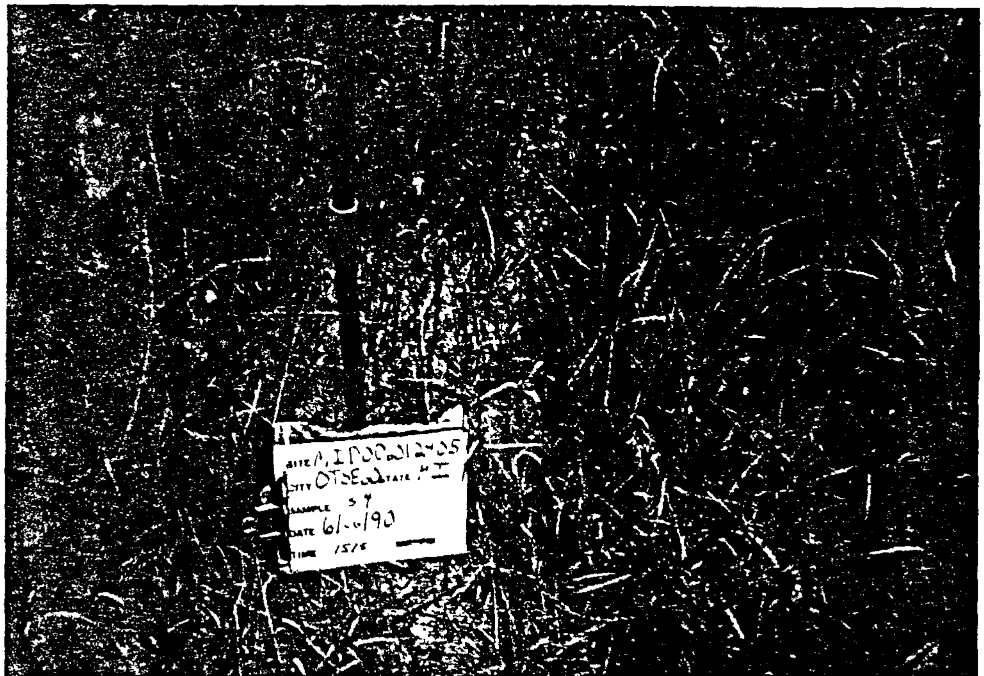
TIME: 1515

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S4



DESCRIPTION: This photograph shows soil sample S4 close up.

DATE: 6/26/90

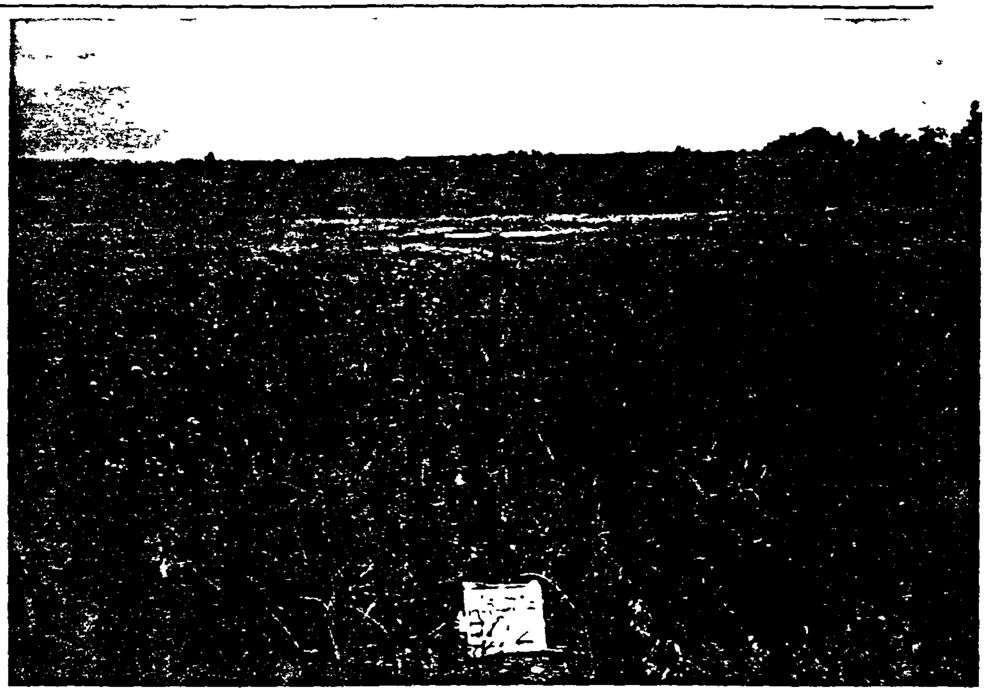
TIME: 1515

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S4



DESCRIPTION: This photograph shows Soil sample S4 distant.

MEN02023

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 5 OF 25

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

TIME: 1615

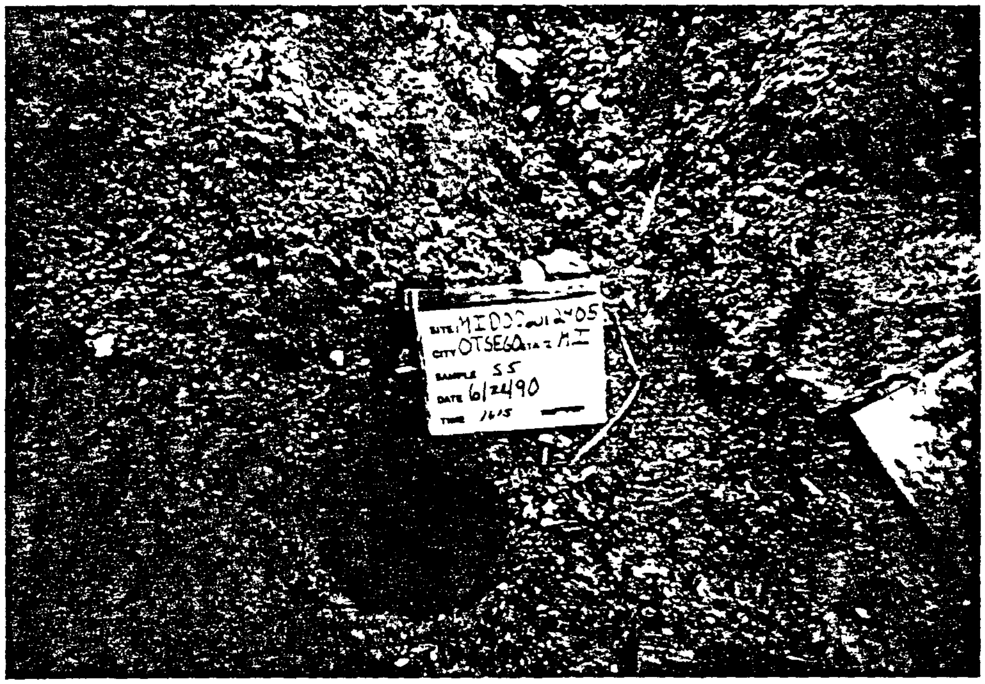
DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy

~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S5



DESCRIPTION: This photograph shows soil sample S5 close up

DATE: 6/26/90

TIME: 1615

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy

~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S5

DESCRIPTION: This photograph shows Soil sample S5 distant.

5. DISCUSSION OF MIGRATION PATHWAYS

5.1 INTRODUCTION

This section presents discussions of data and information pertaining to potential migration pathways and targets of TCL compounds and TAL analytes that are possibly attributable to the MC site.

The five migration pathways of concern discussed are groundwater, surface water, air, fire and explosion, and direct contact.

5.2 GROUNDWATER

Arsenic (156 µg/L) was detected above background level in the groundwater sample collected from monitoring well MW3. Although arsenic cannot be directly attributed to the site because it was not detected in on-site soil samples at concentrations significantly above background level, it appears that arsenic may be potentially attributable to the site because it is used in Menasha Corporation manufacturing processes and well MW3 is a downgradient well (CH2M Hill 1981).

A potential exists for TCL compounds and TAL analytes detected in on-site soil to migrate to groundwater in the vicinity of the MC site, based on the following information.

- TCL compounds and TAL analytes were detected in on-site soil samples, including mercury (7.9NJ mg/kg), toluene (91J µg/kg), and carbon disulfide (15J µg/kg) in soil sample S7 and beryllium (7.6 mg/kg) and copper (416 mg/kg) in soil sample S2 (see Table 4-1 for definitions and interpretations of qualifiers).

- The on-site landfill is not lined.
- Ash has been deposited in the on-site landfill.
- The contents of the former emergency spent liquor pond were alleged to have leached into the groundwater and contaminated two municipal wells and several nearby residential wells.

Some of the volatile organic results from the groundwater samples may have been low because of the excessive bubbling of the water from which the sample was collected.

The geology of the area of the MC site is extensively glaciated. The site is underlain by unconsolidated material, which is composed of glacial drift deposits that extend approximately 250 feet below ground surface in this area (see Appendix E for logs of area wells). The glaciated deposits consist of glacial outwash and moraines made up of glacial till, silt, clay lenses, gravel and boulders, and lenses of sands, gravels, silts, clays, and tills (Western Michigan University [WMU] 1981; CH2M Hill 1981). The glacial material overlies a Coldwater Shale bedrock of Mississippian age (WMU 1981).

Municipal wells and residential wells within a 3-mile radius of the site draw drinking water from the sand and gravel layers in the glacial drift at depths ranging from 33.78 to 220 feet (see Appendix E). Based on area well logs, there does not appear to be a continuous confining layer throughout a 3-mile radius of the site separating the individual water-bearing layers. Therefore, these layers are considered to be hydraulically connected and together form the aquifer of concern (AOC). The depth to groundwater on-site was determined by FIT to be 46.50 feet. The depth to the AOC at the site, therefore, is 46.50 feet. However, the depth to the AOC can be as shallow as 33.78 feet in other areas in the vicinity of the site.

All municipal wells and private wells are screened in the AOC. The nearest municipal well is located approximately 1/2 mile from the site; the nearest private well is located 1/4 mile from the site. The groundwater flow direction in the area of the site was determined to be west-southwest, toward the Kalamazoo River (CH2M Hill 1981).

The potential targets of groundwater contamination include the approximately 12,239 persons supplied by drinking water from municipal wells and private wells within a 3-mile radius of the site. Of this population, 5,000 persons obtain drinking water from the city of Otsego's three municipal wells. All of Otsego's municipal wells are located within a 3-mile radius of the site; water from the wells is blended prior to distribution (Krogmann 1987; Tice 1986). There are 4,502 persons that obtain drinking water from the city of Plainwell's three municipal wells. Two of these municipal wells are located within a 3-mile radius of the site; water from all three wells is blended prior to distribution (Michigan Department of Public Health 1987).

The number of persons who obtain drinking water from private wells within a 3-mile radius of the site in Allegan and Kalamazoo counties was calculated by counting houses on United States Geological Survey (USGS) topographic maps of the area (USGS 1967, 1967a, 1981, 1981a, 1982, 1982a) and multiplying by a value of 2.95 persons per household for Allegan County and a value of 2.87 persons per household for Kalamazoo County (U.S. Bureau of the Census 1982). This calculation yields a total population of 2,737 persons within a 3-mile radius of the site who use private wells.

5.3 SURFACE WATER

Aluminum was detected in a surface water sample collected at the site and it appears to be attributable to the MC site, based on the following information.

- Aluminum was detected above background level in surface water sample SW2, collected from Outfall 003.

- The Menasha Corporation NPDES permit does not cover aluminum.

A potential exists for additional TCL compounds and TAL analytes to migrate to surface water via surface water runoff from the site and through discharge from the outfalls at the site, based on the following information.

- Surface water runoff from the site can reach the adjacent Kalamazoo River via overland migration.

- Noncontact cooling water is discharged from the on-site facility into the Kalamazoo River.

- On October 11, 1985, Menasha Corporation collected samples from outfalls 002 and 003. Results from the sample collected at Outfall 002 revealed 1,2-dichloroethane at 36 µg/L and bromoform at 33 µg/L.

- On September 15 and 16, 1986, MDNR sampled all of the MC site's outfalls. Samples from outfalls 002 and 003 revealed 1,2-dichloroethane and bromoform, and sample results from Outfall 000 revealed high concentrations of total metals.

- In the past, Menasha Corporation has been found in violation of its NPDES permit (MDNR 1978).

- High levels of total organic vapors (up to 1,000 ppm) were detected in the weir house for Outfall 000 during the SSI.

Some of the volatile organic results from surface water samples may be low because of the excessive bubbling of the water from which the sample was collected.

No population within 3 miles downstream of the site receives drinking water from surface water (Michigan Department Public Health 1987). The Kalamazoo River is used for recreational purposes. The target population for surface water is not known.

5.4 AIR

A release of TCL compounds or TAL analytes to the air was not documented during the SSI of the MC site. During the reconnaissance inspection, the FIT site-entry instrument OVA 128 detected up to 1,000 ppm above background levels inside the weir house for Outfall 000. The explosimeter, oxygen meter, hydrogen cyanide monitor, and radiation monitor not detect levels above background concentrations at the site. In accordance with the U.S. EPA-approved work plan, further air monitoring was not conducted by FIT.

A low potential does exist for TCL compounds and TAL analytes to migrate from the site via windblown particulates, because TCL compounds and a TAL analyte were detected in on-site surface soil/sediment samples. However, most of the site is vegetated.

The population within a 4-mile radius of the site potentially affected by a release of TCL compounds and TAL analytes to the air is approximately 13,022 persons. The population was calculated by counting 1,854 houses within a 4-mile radius of the site on USGS topographic maps (USGS 1967, 1967a, 1981, 1981a, 1982, 1982a) and multiplying this figure by a 2.95 persons-per-household average for Allegan County and a 2.87 persons-per-household average for Kalamazoo County (U.S. Bureau of the Census 1982), yielding a total population of 5,469 persons within a 4-mile radius of the site and outside the municipal boundaries of Otsego and Plainwell. The population of Otsego is 3,802 persons, and the population of Plainwell is 3,751 persons. By adding these figures to 5,469, a total air target population of 13,022 persons was calculated.

5.5 FIRE AND EXPLOSION

According to federal, state, and local file information reviewed by FIT and an interview with the fire chief of the Otsego Fire Department, no documentation exists of an incident of fire or explosion at the site (Zantello 1987). According to FIT observations and site-entry equipment readings, no potential for fire or explosion existed at the site at the time of the SSI

5.6 DIRECT CONTACT

According to federal, state, and local file information reviewed by FIT, observations made during the SSI, and the interview with the site representatives, no incidents of direct contact with TCL compounds or TAL analytes at the MC site have been documented. However, there is a potential that the public may come into direct contact with TCL compounds and TAL analytes at the site, based on the following information.

- Access to the site is not restricted; no security guard or other means of security are used at the site (Kling et al. 1990).

- TCL compounds and TAL analytes were detected in on-site soil/sediment samples and surface water samples.

- Two municipal wells and nearby residential wells were alleged to have been contaminated by wastes seeping from a pond on-site.

The population within a 1-mile radius of the site potentially affected through direct contact with TCL compounds and TAL analytes at the site is 3,996 persons. This population was calculated by counting 66 houses within a 1-mile radius of the site on a USGS topographic map (USGS 1967) and multiplying this number by a persons-per-household value of 2.95 (U.S. Bureau of the Census 1982), yielding a total population of 194 persons within a 1-mile radius of the site and outside the municipal boundaries of the city of Otsego.

This figure was added to the population figure for the portion of the city of Otsego within a 1-mile radius of the site (3,802). The total direct contact target population consists of 3,996 persons.

6. REFERENCES

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Krogmann, John, June 25, 1987, Assistant Superintendent, Otsego Department of Public Works, telephone conversation, contacted by Randy Livingston of E & E.

MDNR, December 3, 1978, Potential Ground Water Contamination Source Identification and Preliminary Assessment, prepared for Menasha Corporation, Otsego, Michigan.

__________, May 31, 1985, Menasha Corporation application for an NPDES permit, submitted to Fred Morley, District Supervisor, MDNR, Plainwell District.

__________, March 14, 1986, <u>Potential Hazardous Waste Site Preliminary Assessment</u>, for the MC site, U.S. EPA ID: MID006012405, prepared by Cheryl Wallace, Groundwater Quality Division, MDNR, Site Assessment Unit, Lansing, Michigan.

__________, September 15 and 16, 1986a, report, Industrial Wastewater Survey, conducted at the MC site, prepared by the Environmental Protection Bureau Point Source Monitoring Section.

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__________, 1967a, photorevised 1973, Kalamazoo Northeast, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

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__________, 1982, Martin, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

__________, 1982a, Orangeville, Michigan Quadrangle, 7.5 Minute Series: 1:24,000.

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Zantello, Gary, June 25, 1987, Fire Chief, Otsego Fire Department, telephone conversation, contacted by Randy Livingston of E & E.

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APPENDIX A

SITE 4-MILE RADIUS MAP

APPENDIX B

U.S. EPA FORM 2070-13

MEN02035

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Menasha Corporation	320 North Farmer Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Otsego	MI	49078	Allegan	05	04

09 COORDINATES — LATITUDE: 42 27 45.0 — LONGITUDE: 085 41 10.0

10 TYPE OF OWNERSHIP (Check one): ■ A. PRIVATE ☐ B. FEDERAL ______ ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ______ ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION: 6/25-27/90 (MONTH DAY YEAR)

02 SITE STATUS: ■ ACTIVE ☐ INACTIVE

03 YEARS OF OPERATION: 1939 / Present (BEGINNING YEAR / ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply): ☐ A. EPA ■ B. EPA CONTRACTOR E.&E. INC. (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ______ (Name of firm) ☐ E. STATE ☐ F. STATE CONTRACTOR ______ (Name of firm) ☐ G. OTHER ______ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
Randy Livingston	Geographer	E.&E. INC.	(312) 663-9415

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
Bill Schaefer	Environmental Engineer	E.&E. INC.	(312) 663-9415
Cindy Schultz	Environmental Health Specialist	E.&E. INC.	(312) 663-9415
Scott Turek	Geologist	E.&E. INC.	(312) 663-9415
Ray Whitlock	Chemist	E.&E. Inc	(312) 663-9415
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO.
Keith Kling	Environmental Director	320 N. Farmer St. Otsego, MI 49078	(616) 692-6141
John R. Banwkamp P.E.	Senior Environ. Engineer	Box 367 Neenah, WI	(414) 751-1991
Len Myers	Environmental Technician	320 N. Farmer St. Otsego, MI 49078	(616) 692-6141
John Bonhan	Engineering & Tech. Service Manager	320 N. Farmer St Otsego, MI 49078	(616) 692-6141
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
■ PERMISSION ☐ WARRANT	1300/0800/0800	Sunny, partly Cloudy ~75°F / ~70°F overcast rain / Sunny Partly Cloudy ~69-80°F.

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Larry Thornton	Michigan Dept. of Natural Resources	(517) 275-5151

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
Randy Livingston	U.S. EPA Region V	E.&E. Inc.	(312) 663-9415	10, 6, 90 (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

MEN02036

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ■ A. SOLID
- ☐ B. POWDER, FINES
- ■ C. SLUDGE
- ☐ D. OTHER ______ (Specify)
- ☐ E. SLURRY
- ■ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

- TONS ______
- CUBIC YARDS Unknown
- NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply)

- ■ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ■ D. PERSISTENT
- ■ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			REFER TO TABLES
PSD	PESTICIDES			4-1, 4-2 AND 4-3
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
	See TABLE 4-1 for chemical analysis of soil and sediment samples collected by FIT on June 26+27, 1990, Summary Sheet.				
	See TABLE 4-2 for chemical analysis of monitoring well samples collected by FIT on June 26, 1990, Summary sheet.				
	See TABLE 4-3 for chemical analysis of surface water samples collected by FIT on June 27, 1990, Summary Sheet.				

V. FEEDSTOCKS (See Appendix for CAS Numbers) NA

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Ecology and Environment Inc., FIT, Site reconnaissance inspection from June 25-27, 1990

Michigan Department of Natural Resources files.

EPA	POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS	I. IDENTIFICATION 01 STATE: MI 02 SITE NUMBER: D006012405

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 12,239
04 NARRATIVE DESCRIPTION

SEE SECTION 5.2 OF NARRATIVE.

01 ■ B. SURFACE WATER CONTAMINATION — 02 ■ OBSERVED (DATE 6/27/90) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 0
04 NARRATIVE DESCRIPTION

SEE SECTION 5.3 OF NARRATIVE.

01 ■ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 13,022
04 NARRATIVE DESCRIPTION

SEE SECTION 5.4 OF NARRATIVE.

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED. NA
04 NARRATIVE DESCRIPTION

SEE SECTION 5.5 OF NARRATIVE.

01 ■ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED. 3,996
04 NARRATIVE DESCRIPTION

SEE SECTION 5.6 OF NARRATIVE.

01 ■ F. CONTAMINATION OF SOIL — 02 ■ OBSERVED (DATE June 26-27/90) ☑ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED UNKNOWN (Acres)
04 NARRATIVE DESCRIPTION

SEE TABLE 4-1 ANALYTICAL SUMMARY.

01 ■ G. DRINKING WATER CONTAMINATION — 02 ■ OBSERVED (DATE 1974) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 12,239
04 NARRATIVE DESCRIPTION

SEE SECTION 5.2 OF NARRATIVE.

01 ■ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED 220
04 NARRATIVE DESCRIPTION

SEE SECTION 2.3 OF NARRATIVE.

01 ■ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 13,022
04 NARRATIVE DESCRIPTION

SEE SECTION 5 OF NARRATIVE.

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ■ J. DAMAGE TO FLORA — 02 ■ OBSERVED (DATE 6/25-27/90) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Areas of stressed vegetation were observed around the aeration pond on-site.

01 ■ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

NONE OBSERVED OR DOCUMENTED. A potential exists for damage to fauna to occurr through the ingestion of contaminated flora

01 ■ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED. SEE J. & K. ABOVE. A potential exists through the bioaccumilation of Contaminants.

01 ■ M. UNSTABLE CONTAINMENT OF WASTES (Spills/Runoff/Standing liquids, Leaking drums) — 02 ■ OBSERVED (DATE 1974) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12,239
04 NARRATIVE DESCRIPTION

The emergency storage spent liquor pond content had seeped into the groundwater resulting in contaminating two municipal wells and several residential wells

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

NONE OBSERVED OR DOCUMENTED.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

N/A

III. TOTAL POPULATION POTENTIALLY AFFECTED: 13,022

IV. COMMENTS

NONE.

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Ecology and Environment Inc., FIT site interview 6/25/90 and inspection 6-25-27-90.
E. & E. Inc. FIT Files, Michigan Dept. of Natural Resources files.
U.S.G.S Topograph Maps.

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
■ A. NPDES	MI0003824	5/21/85	5/31/90	Now operating with interim permit
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
■ I. OTHER (Specify) Groundwater	MI0000333	3/31/85	3/31/90	operating with interim permit.
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
■ F. LANDFILL - Closed	UNKNOWN	UNKNOWN
☐ G. LANDFARM		
☐ H. OPEN DUMP		
■ I. OTHER 6 ponds (Specify)	on-site	UNKNOWN

04 TREATMENT (Check all that apply)

- ■ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ■ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ■ G. OTHER RECYCLING/RECOVERY Ash
- ☐ H. OTHER ______ (Specify)

05 OTHER

■ A. BUILDINGS ON SITE 6

06 AREA OF SITE

90 (Acres)

07 COMMENTS

SEE SECTIONS 2.3 and 3.3 OF NARRATIVE.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ■ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

The One large aeration pond and the Two settling ponds are not lined. The large aeration pond has cement bottom and sides.
The landfill is not lined.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ■ YES ☐ NO

02 COMMENTS

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Ecology and Environment Inc., FIT Site interview and inspection 6-25-27-90.
E.&E. Inc., FIT Files, Michigan Dept. of Natural Resources files.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: MI
02 SITE NUMBER: D006012405

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)	SURFACE	WELL	02 STATUS: ENDANGERED	AFFECTED	MONITORED	03 DISTANCE TO SITE
COMMUNITY	A. ☐	B. ■	A. ☐	B. ☐	C. ■	A. .50 (mi)
NON-COMMUNITY	C. ☐	D. ■	UNKNOWN D. ☐	E. ☐	F. ☐	B. ~.25 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

■ A. ONLY SOURCE FOR DRINKING
☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER: 12,239

03 DISTANCE TO NEAREST DRINKING WATER WELL: .25+ .50 (mi)

04 DEPTH TO GROUNDWATER: 46.50 (ft)

05 DIRECTION OF GROUNDWATER FLOW: West Southwest

06 DEPTH TO AQUIFER OF CONCERN: 46.50 (ft)

07 POTENTIAL YIELD OF AQUIFER: UKNOWN (gpd)

08 SOLE SOURCE AQUIFER: ☐ YES ■ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

SEE SECTION 5.2 OF NARRATIVE.

10 RECHARGE AREA
■ YES
☐ NO
COMMENTS: Percolation thru sandy soils recharges. Also the river in the area could provide recharge to the groundwater system

11 DISCHARGE AREA
■ YES
☐ NO
COMMENTS: The groundwater below the site is likely to discharge to the Kalamazoo river.

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

■ A. RESERVOIR, RECREATION DRINKING WATER SOURCE
☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES
☐ C. COMMERCIAL, INDUSTRIAL
☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Kalamazoo river	■	0 Ft ~~(mi)~~
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 3,996 NO. OF PERSONS	B. 6,727 NO. OF PERSONS	C. 12,092 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION: 50 Ft ~~(mi)~~

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE: 2,280

04 DISTANCE TO NEAREST OFF-SITE BUILDING: 50 Ft. ~~(mi)~~

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Population within the vicinity of the site is sparsely populated.

MEN02041

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POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ■ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ■ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☐ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
90 (ft)	UNKNOWN (ft)	UNKNOWN

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
3.20 (in)	2.2 (in)	20 %	South	10 %

09 FLOOD POTENTIAL

SITE IS IN NA YEAR FLOODPLAIN

10 NA ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE A. NA (mi) OTHER B. Adjacent (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

NA (mi)

ENDANGERED SPECIES: NA

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AG LAND
A. 50 Ft. ~~(mi)~~	B. 50 Ft ~~(mi)~~	C. NA (mi)	D. ~ 400 Ft. ~~(mi)~~

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

SEE APPENDIX A.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Uncontrolled Hazardous Waste Site Ranking System Manual - Federal Register, 7-16-82.
U.S.G.S., Topographic Maps; Merson, Martin and Otsego, Michigan, Quads, 7.5 min. series.
E. + E. Inc., FIT site inspection 6-25-27-90.
Characteristics of Population, Number of Inhabitants, Michigan, 1980, Census of Population,
U.S. Dept. of Commerce Bureau of the Census.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	7		
SURFACE WATER	6		
WASTE			
AIR		SEE SECTIONS 3(3.4) & 4	
RUNOFF			
SPILL			
SOIL / Sediment	10		
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS Detected 800ppm - 1,000ppm inside of weir house #000.
OVA 128	Detected .5ppm above background on site.
Explosimeter	0 % LEL
Monitox	0ppm
O_2 Meter	No Reading above or below background detected.
Radiation Alert	No Reading above .1 MRem/HR. detected.

IV. PHOTOGRAPHS AND MAPS

01 TYPE ■ GROUND ☐ AERIAL

02 IN CUSTODY OF E. & E., INC., FIT, Region V, Chicago, IL
(Name of organization or individual)

03 MAPS ■ YES ☐ NO

04 LOCATION OF MAPS E. & E., INC., FIT, Region V, Chicago, IL

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

PH
Conductivity
Temperature
SEE TABLE 4-2.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

E. & E., INC., FIT site inspection 4/9th & 10th/1990.

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER		08 NAME (PARENT COMPANY (If applicable))	09 D+B NUMBER	
Menasha Corporation					
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		10 STREET ADDRESS (P O Box, RFD # etc)	11 SIC CODE	
320 N. Farmer Street					
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
Otsego	MI	49078			
01 NAME	02 D+B NUMBER		08 NAME	09 D+B NUMBER	
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		10 STREET ADDRESS (P O Box, RFD # etc)	11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
01 NAME	02 D+B NUMBER		08 NAME	09 D+B NUMBER	
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		10 STREET ADDRESS (P O Box, RFD # etc)	11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
01 NAME	02 D+B NUMBER		08 NAME	09 D+B NUMBER	
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		10 STREET ADDRESS (P O Box, RFD # etc)	11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first) / IV. REALTY OWNER(S) (If applicable, list most recent first)

01 NAME	02 D+B NUMBER		01 NAME	02 D+B NUMBER	
David Greene					
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE	
P.O. Box 155					
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078			
01 NAME	02 D+B NUMBER		01 NAME	02 D+B NUMBER	
George Bardeen Paper Mill					
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE	
P.O. Box 155					
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078			
01 NAME	02 D+B NUMBER		01 NAME	02 D+B NUMBER	
03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE		03 STREET ADDRESS (P O Box, RFD # etc)	04 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

E. + E., Inc., FIT site interview 6/25/90.
E. + E., Inc. FIT Files
MDNR Files.

MEN02044

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER
Menasha Corporation	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
320 N. Farmer Street	

05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078

08 YEARS OF OPERATION	09 NAME OF OWNER
1939 to Present	Menasha Corporation

OPERATOR'S PARENT COMPANY (If applicable) NA

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER
Otsego Falls Paper Mills	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
320 N. Farmer Street	

05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD
1934 - 1939	David Greene

01 NAME	02 D+B NUMBER
Bardeen Paper Mill	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
P.O. Box 155	

05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD
1887 - 1934	George Bardeen

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable) NA

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E. & E., Inc., FIT Site interview 6/25/90.
E. & E., Inc., FIT Files.
MDNR Files.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D006012405

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
Menasha Corporation	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
320 N. Farmer Street	

05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078

III. OFF-SITE GENERATOR(S) NA

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Menasha Corporation			

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
320 N. Farmer Street			

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
Otsego	MI	49078			

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E.&E. Inc., FIT Site interview 6/25/90.
E.&E. Inc., FIT Files.
MDNR Files.

MEN02046

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D006012405

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA SEE SECTION 2.3

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA SEE SECTION 2.3

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ■ E. CONTAMINATED SOIL REMOVED — 02 DATE 1985 03 AGENCY Menasha Corp.
04 DESCRIPTION Contaminated soils were excavated from on-site ponds and transported to a Type II Landfill off-site.

01 ☐ F. WASTE REPACKAGED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
UNKNOWN

01 ■ G. WASTE DISPOSED ELSEWHERE — 02 DATE 1985 03 AGENCY Menasha Corp.
04 DESCRIPTION The contaminated soils were transported to a Type II Landfill off-site.

01 ☐ H. ON SITE BURIAL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ L. ENCAPSULATION — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ N. CUTOFF WALLS — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Q. SUBSURFACE CUTOFF WALL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
MI	D00 6012405

II PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ S. CAPPING/COVERING 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ T. BULK TANKAGE REPAIRED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ U. GROUT CURTAIN CONSTRUCTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ V. BOTTOM SEALED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ W. GAS CONTROL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ X. FIRE CONTROL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Y. LEACHATE TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ Z. AREA EVACUATED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 1. ACCESS TO SITE RESTRICTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 2. POPULATION RELOCATED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
NA

01 ☐ 3. OTHER REMEDIAL ACTIVITIES NA 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
SEE SECTION 2.3.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analyses, reports)

E. + E. Inc., FIT site interview 6/25/90
E. + E. Inc., FIT Files.
MDNR Files.

MEN02048

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
MI	D0060M2405

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ■ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

SEE SECTION 2.3

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E. + E. Inc., FIT, Site interview 6/25/90.
E. + E. Inc., FIT, Files.
MDNR Files.

EPA FORM 2070-13 (7-81)

APPENDIX C

F[illegible]T SITE PHOTOGRAPHS

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 1 OF 23

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

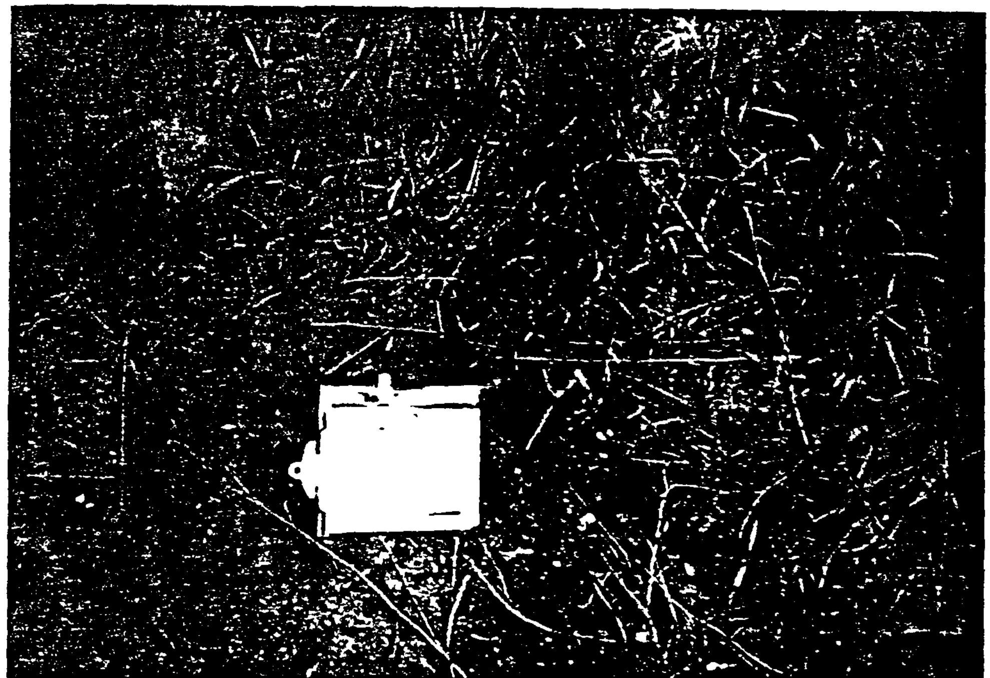
TIME: 1540

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S1



DESCRIPTION: This photograph shows soil sample S1 close-up.

DATE: 6/26/90

TIME: 1540

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S1

DESCRIPTION: This photograph shows soil sample S1 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 2 OF 23

U.S. EPA ID: MI000601 2405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

TIME: 1535

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S2

DESCRIPTION: This photograph shows soil sample S2 close up.

DATE: 6/26/90

TIME: 1535

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S2

DESCRIPTION: This photograph shows soil sample S2 distant.

MEN02052

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION　　PAGE 3 OF 28

U.S. EPA ID: MI0006012405　TDD: F05-9005-008　PAN: FMI0721SA

DATE: 6/26/90

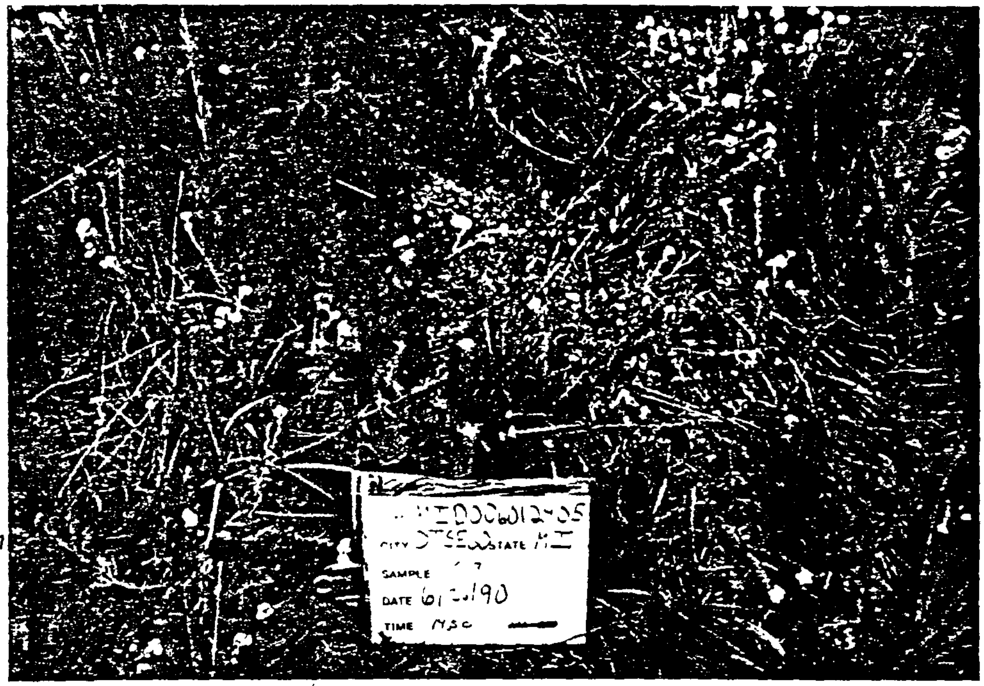
TIME: 1450

DIRECTION OF PHOTOGRAPH: Northwest

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S3



DESCRIPTION: This photograph shows soil sample S3 close up.

DATE: 6/26/90

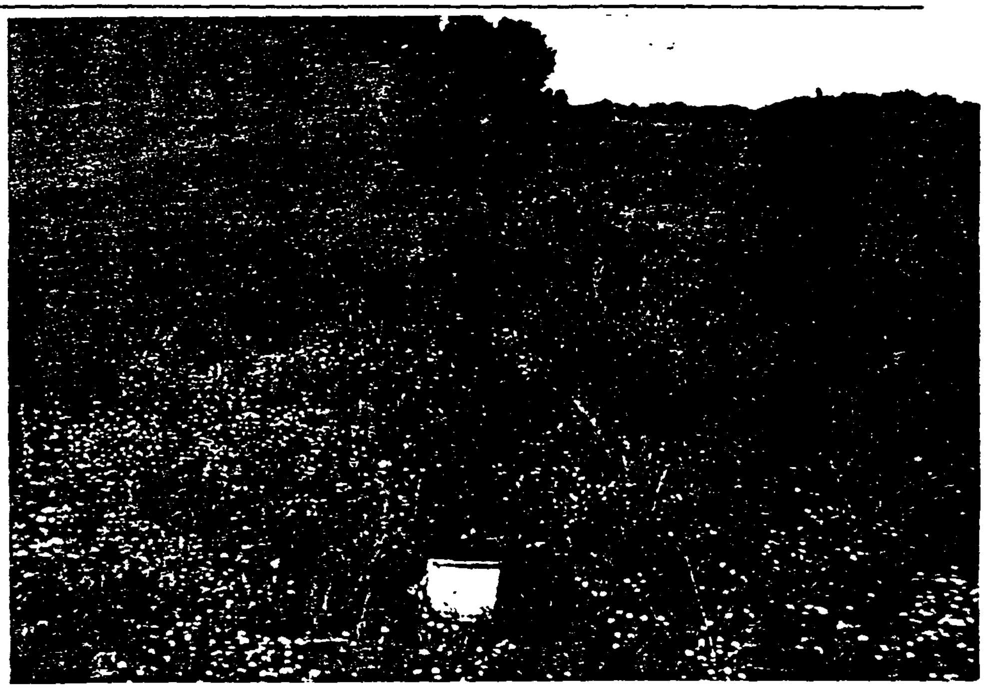
TIME: 1450

DIRECTION OF PHOTOGRAPH: Northwest

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S3



DESCRIPTION: This photograph shows soil sample S3 distant.

MEN02053

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 4 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

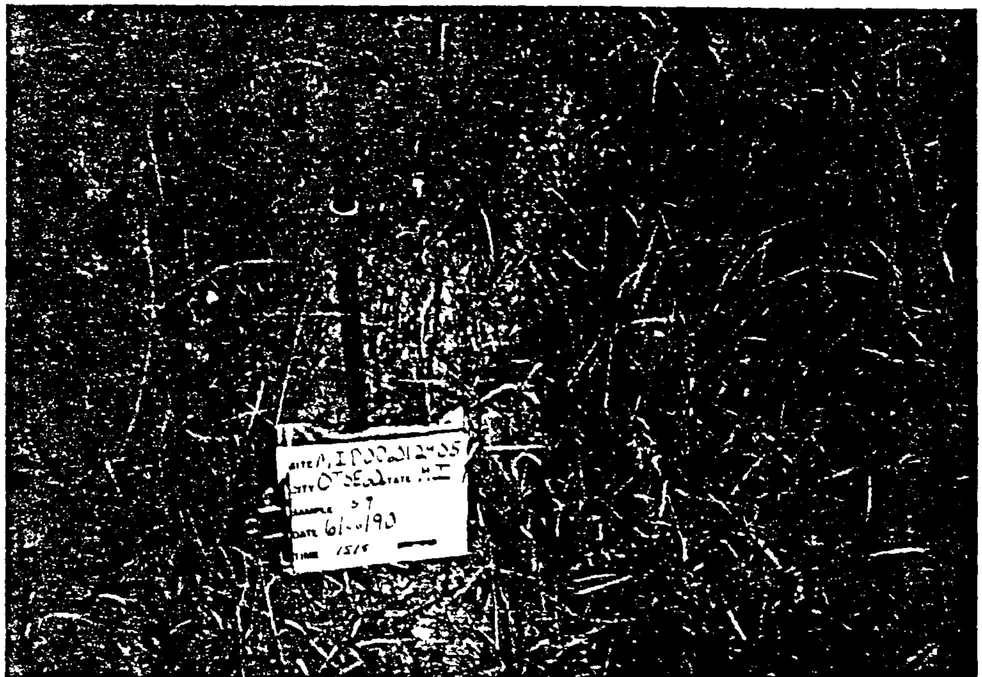
TIME: 1515

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S4



DESCRIPTION: This photograph shows soil sample S4 close up.

DATE: 6/26/90

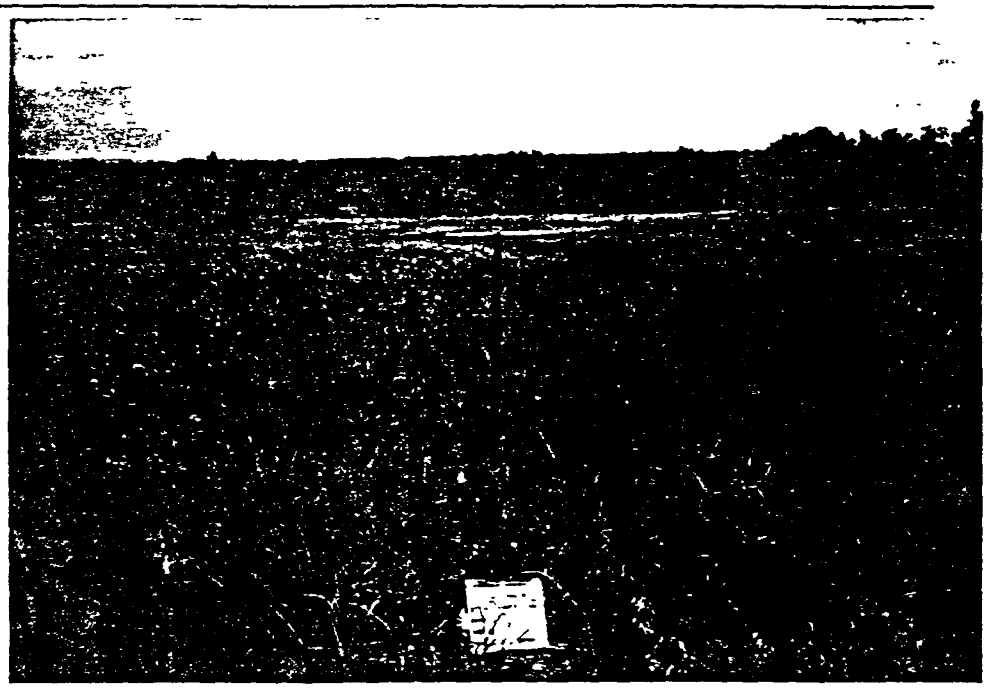
TIME: 1515

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S4



DESCRIPTION: This photograph shows soil sample S4 distant.

MEN02054

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 5 OF 25

U.S. EPA ID: MI000 6012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

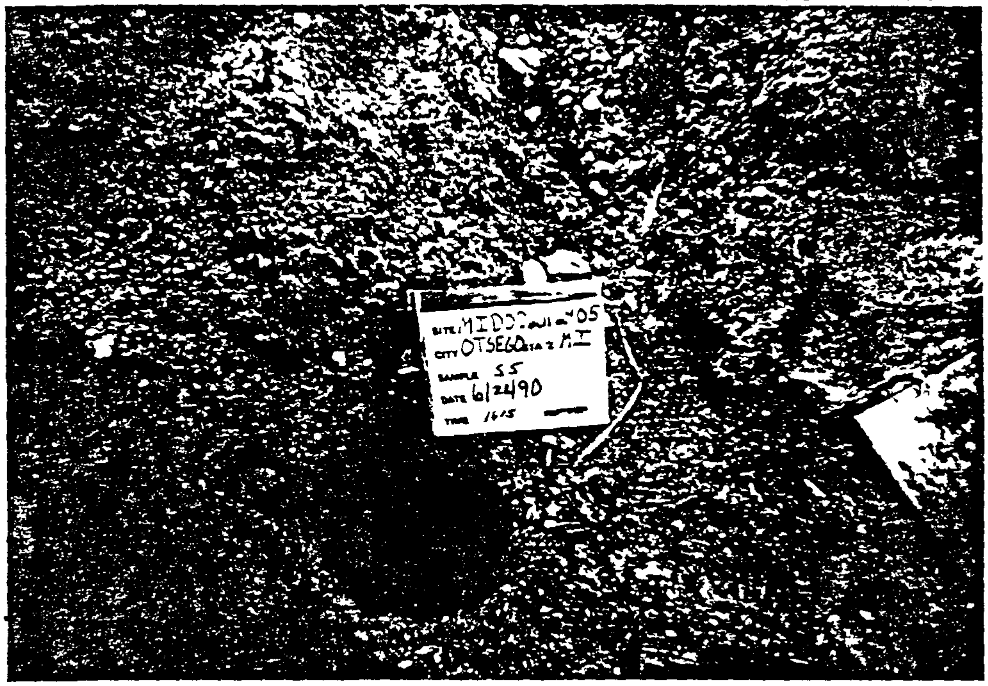
TIME: 1615

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S5



DESCRIPTION: This photograph shows soil sample S5 closeup

DATE: 6/26/90

TIME: 1615

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S5

DESCRIPTION: This photograph shows soil sample S5 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 6 OF 25

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

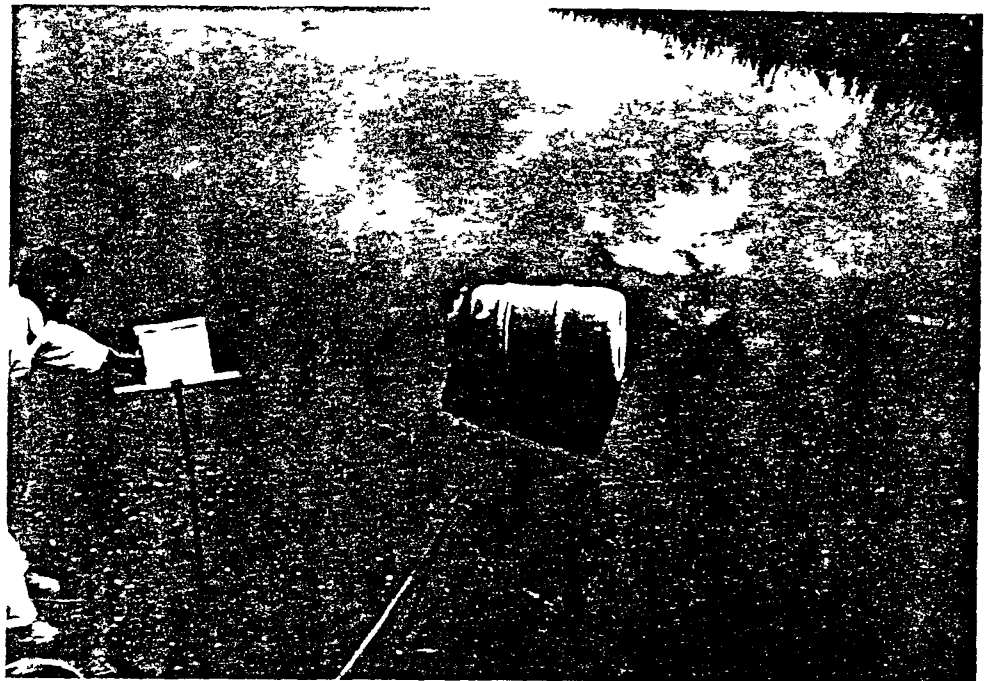
TIME: 1200

DIRECTION OF PHOTOGRAPH: Northeast

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S6



DESCRIPTION: This photograph shows soil sample S6 close up.

DATE: 6/27/90

TIME: 1200

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S6

DESCRIPTION: This photograph shows soil sample S6 distance

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 7 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

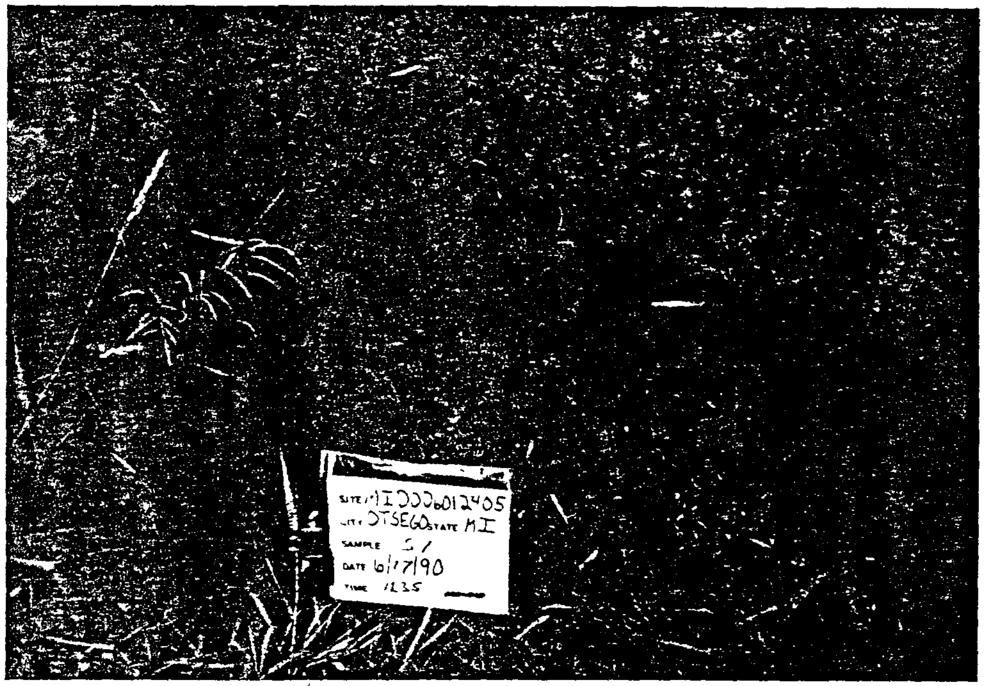
TIME: 1235

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, partly Cloudy, ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S7



DESCRIPTION: This photograph shows Soil Sample S7 Close up.

DATE: 6/27/90

TIME: 1235

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S7

DESCRIPTION: This photograph shows Soil sample S7 distant.

MEN02057

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 8 OF 28

U.S. EPA ID: MI000 6012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

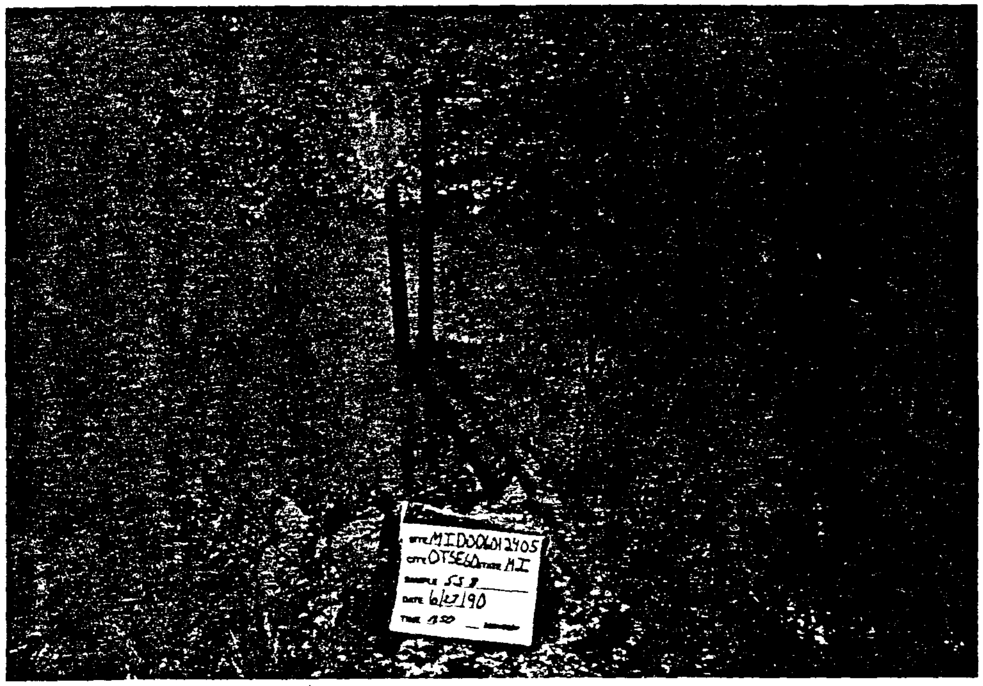
TIME: 1250

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Sunny, Partly Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S8



DESCRIPTION: This photograph shows Soil Sample S8 Close up.

DATE: 6/27/90

TIME: 1250

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Sunny, Partly Cloudy ~ 70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S8

DESCRIPTION: This photograph shows Soil sample S8 distant.

MEN02058

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 9 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

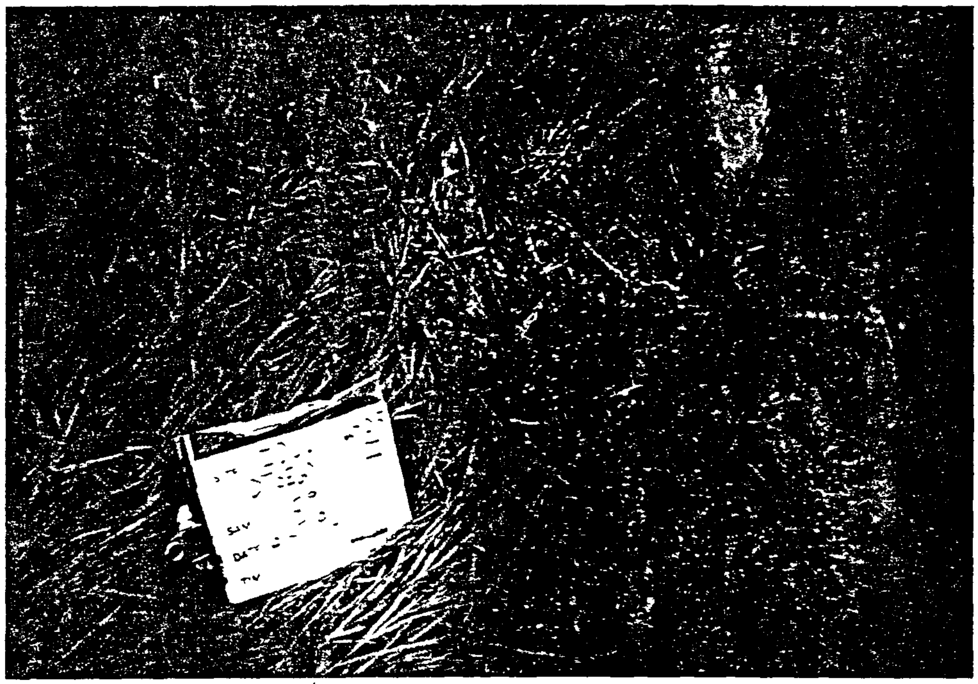
TIME: 1400

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S9



DESCRIPTION: This photograph shows Soil Sample S9 close up.

DATE: 6/27/90

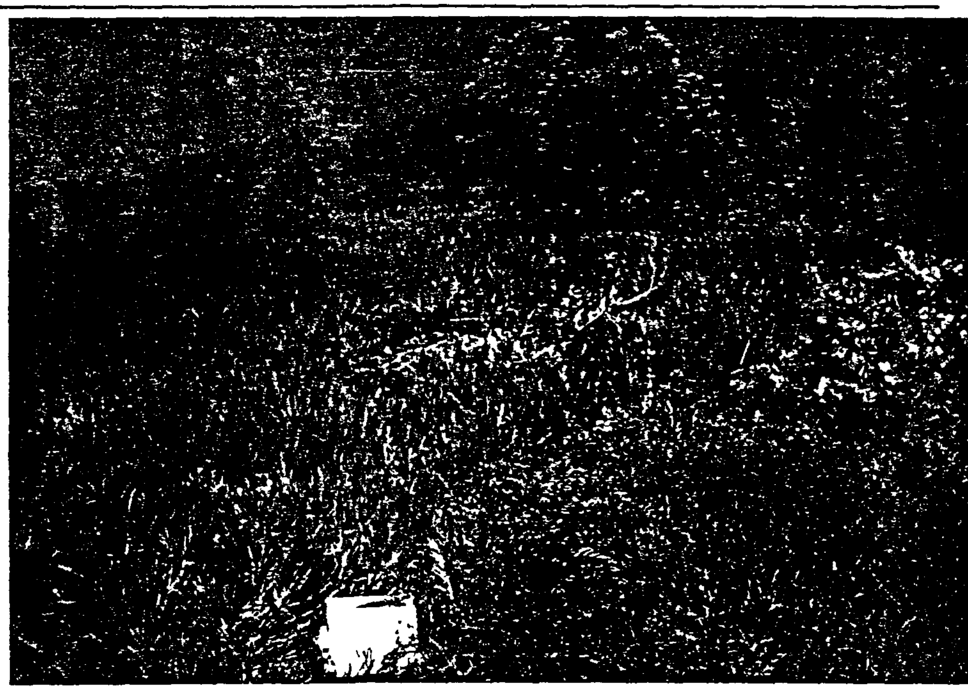
TIME: 1400

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S9



DESCRIPTION: This photograph shows Soil Sample S9 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 10 OF 25

U.S. EPA ID: MID000601240S TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1401

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S10

DESCRIPTION: This photograph shows Soil Sample S10 close up.

DATE: 6/27/90

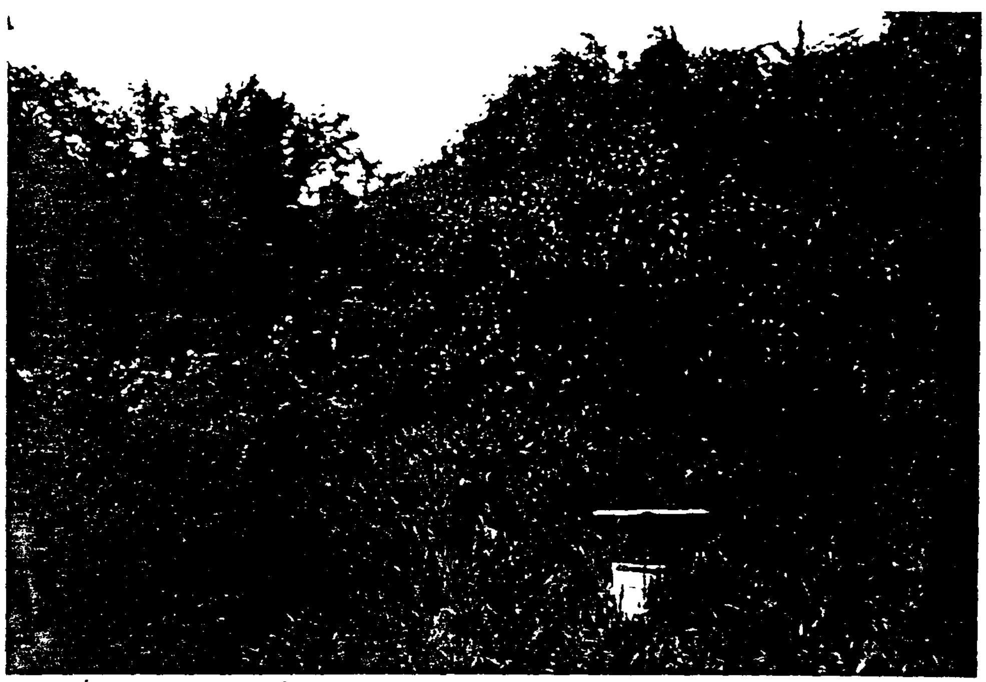
TIME: 1401

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): S10



DESCRIPTION: This photograph shows Soil sample S10 distant.

MEN02060

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 11 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

TIME: 1220

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Overcast ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW1

DESCRIPTION: This photograph shows monitoring well sample MW1 close up.

DATE: 6/26/90

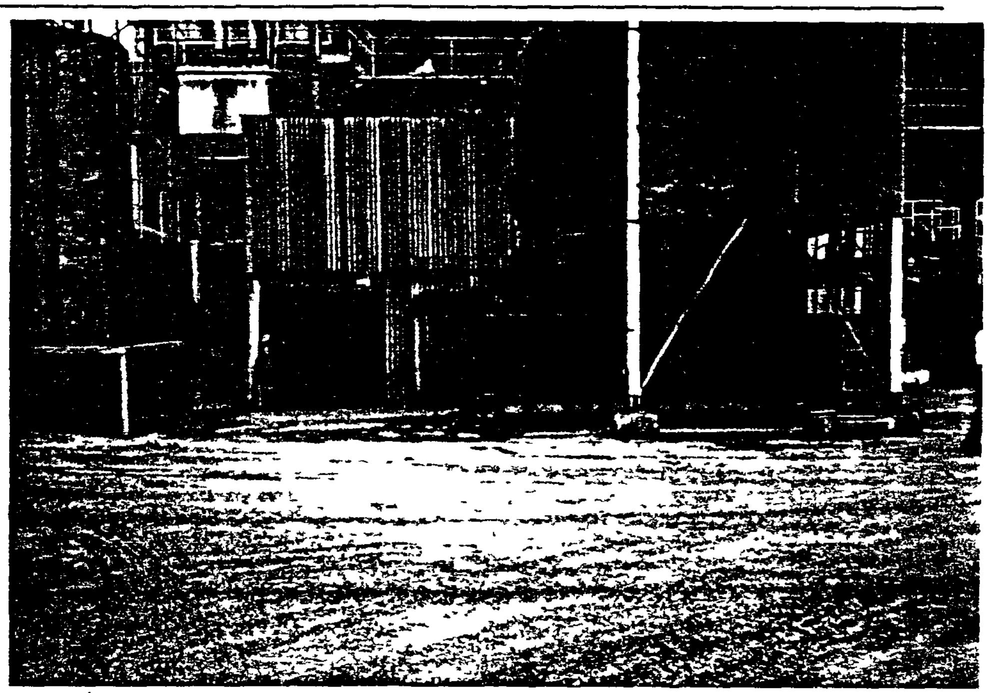
TIME: 1220

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Overcast ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW1



DESCRIPTION: This photograph shows monitoring well sample MW1 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 12 OF 25

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FWI0721SA

DATE: 6/26/90

TIME: 1221

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Overcast ~70°F

PHOTOGRAPHED BY: Randi Livingston

SAMPLE ID (if applicable): MW1

DESCRIPTION: This photograph shows the actual well of sample MW1.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

TIME: 1108

DIRECTION OF PHOTOGRAPH: West

WEATHER CONDITIONS: Overcast

~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW2

DESCRIPTION: This photograph shows monitoring well sample MW2 close up.

DATE: 6/26/90

TIME: 1108

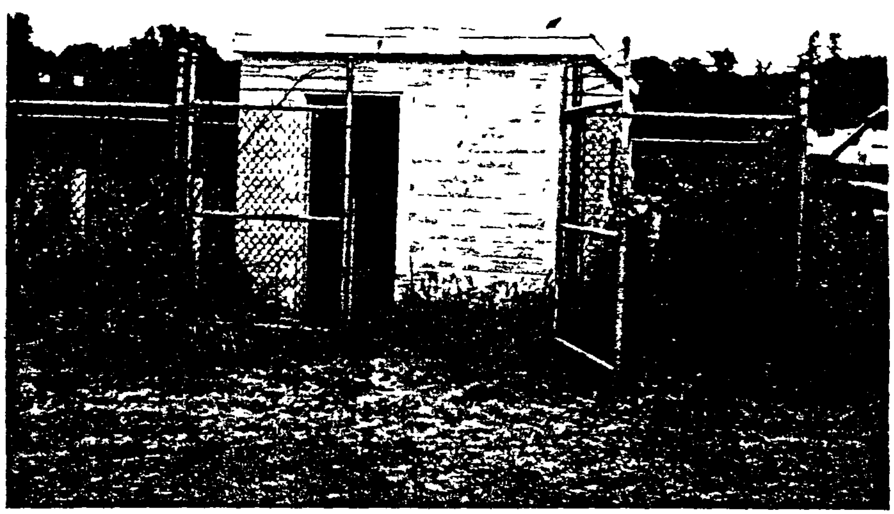
DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Overcast

~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW2



DESCRIPTION: This photograph shows monitoring well sample MW2 distant.

MEN02063

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 14 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

TIME: 1420

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW3

DESCRIPTION: This photograph shows monitoring well sample MW3 close up.

DATE: 6/26/90

TIME: 1420

DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW3

DESCRIPTION: This photograph shows monitoring well sample MW3 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 15 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

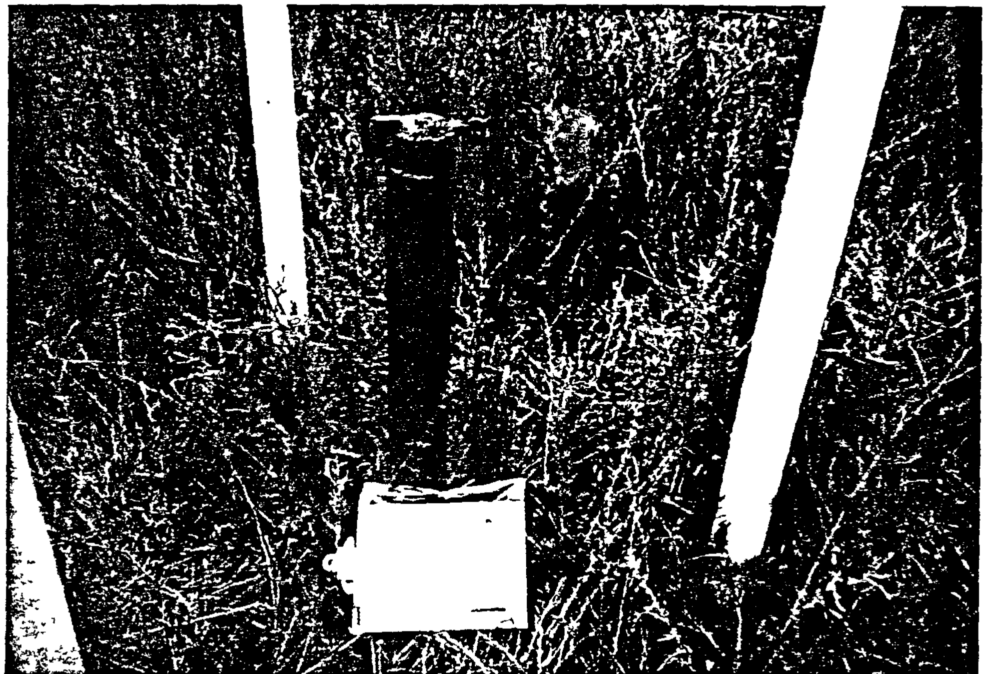
TIME: 1515

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW4



DESCRIPTION: This photograph shows monitoring well sample MW4 close up.

DATE: 6/26/90

TIME: 1515

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW4

DESCRIPTION: This photograph shows monitoring well sample MW4 distant.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 16 OF 28

U.S. EPA ID: MI000601240S TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/26/90

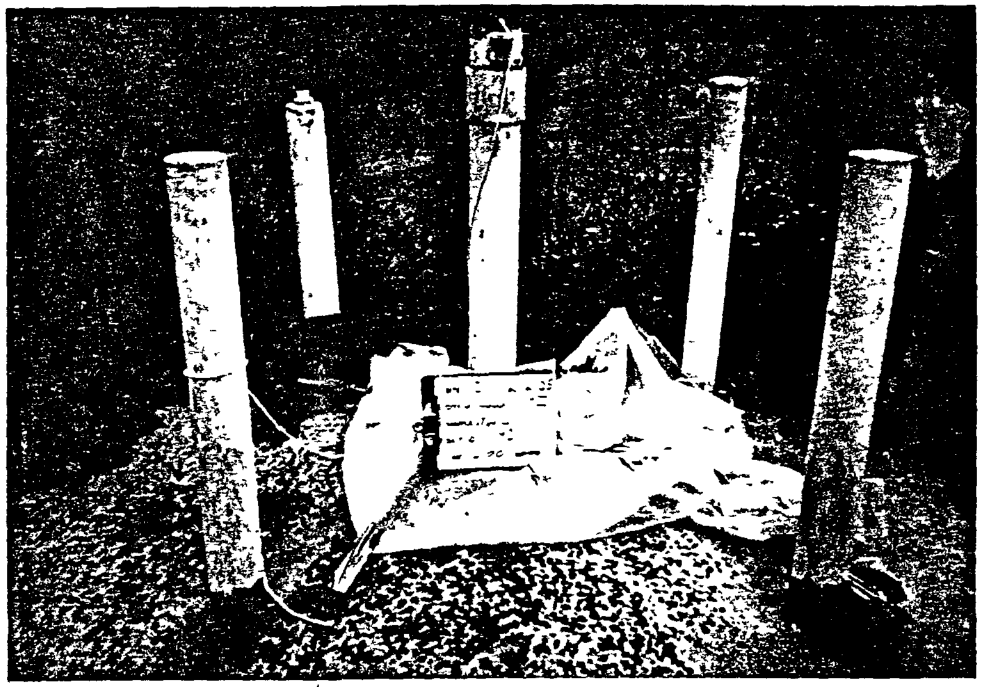
TIME: 1245

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW5



DESCRIPTION: This photograph shows monitoring well sample MW5 close up.

DATE: 6/26/90

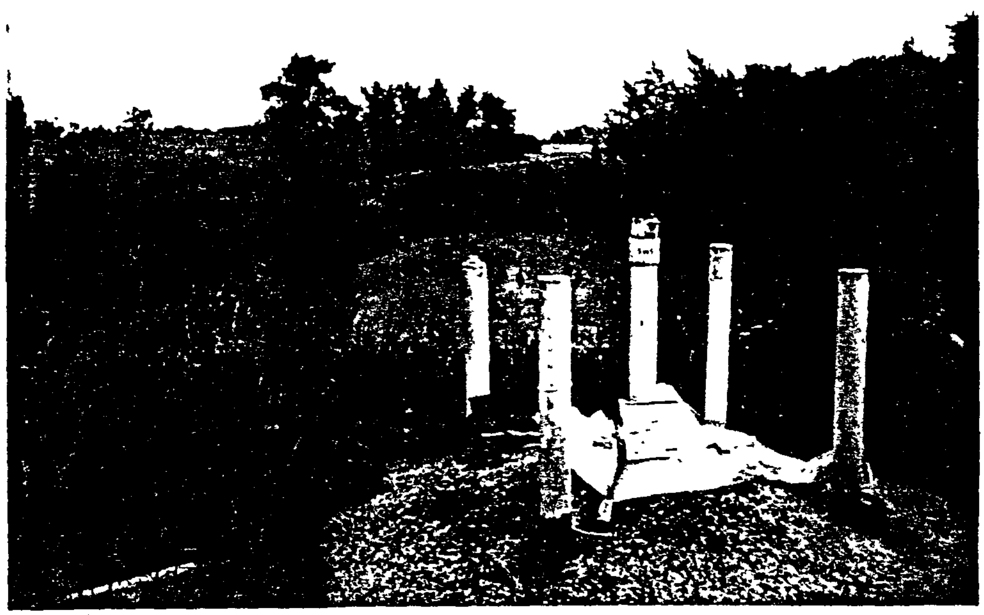
TIME: 1245

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Overcast - rain ~70°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): MW5



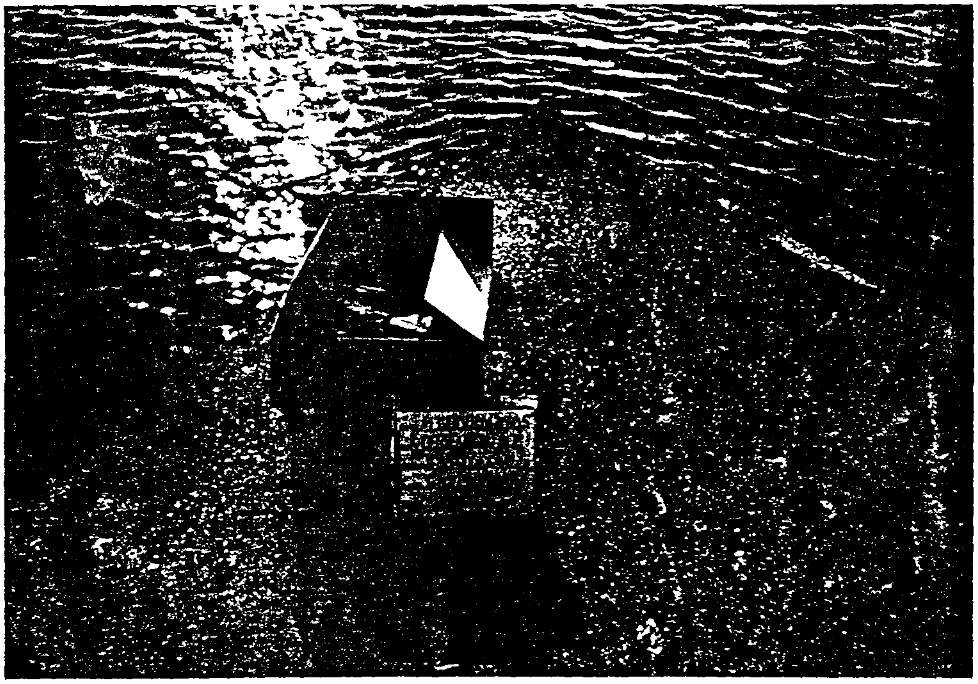
DESCRIPTION: This photograph shows monitoring well sample MW5 distant.

MEN02066

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 17 OF 25

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA



DATE: 6/27/90

TIME: 0910

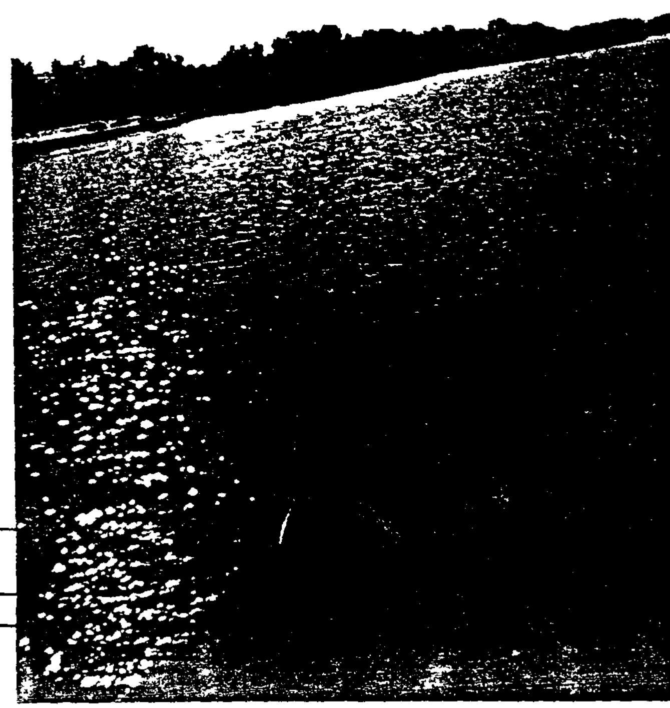
DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW1

DESCRIPTION: This photograph shows surface water sample SW1 close up.



DATE: 6/27/90

TIME: 0910

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW1

DESCRIPTION: This photograph shows surface water sample SW1 distant.

MEN02067

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 18 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-003 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1045

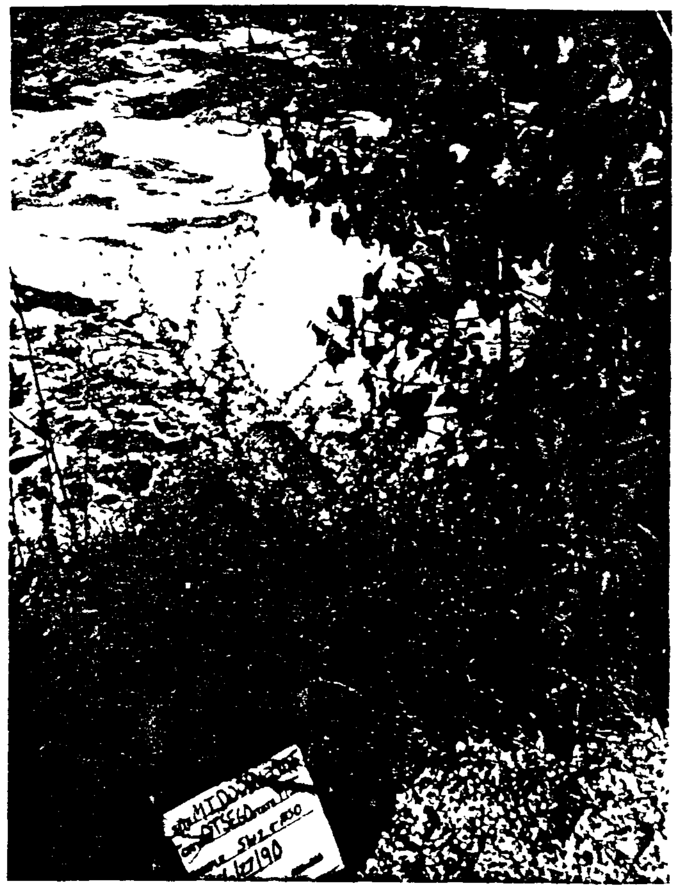
DIRECTION OF PHOTOGRAPH: South

WEATHER CONDITIONS: Sunny Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW2

DESCRIPTION: This photograph shows surface water sample SW2 close up.



DATE: 6/27/90

TIME: 1045

DIRECTION OF PHOTOGRAPH: West

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW2

DESCRIPTION: This photograph shows surface water sample SW2 distant.

FIELD PHOTOGRAPHY LOG SHEET

MEN02068

SITE NAME: MENASHA CORPORATION

U.S. EPA ID: WID006012405 TDD: F05-9005-008 PAN: FWI0721SA

DATE: 6/27/90

TIME: 1100

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW3

DESCRIPTION: This photograph shows surface water sample SW3 closeup.

DATE: 6/27/90

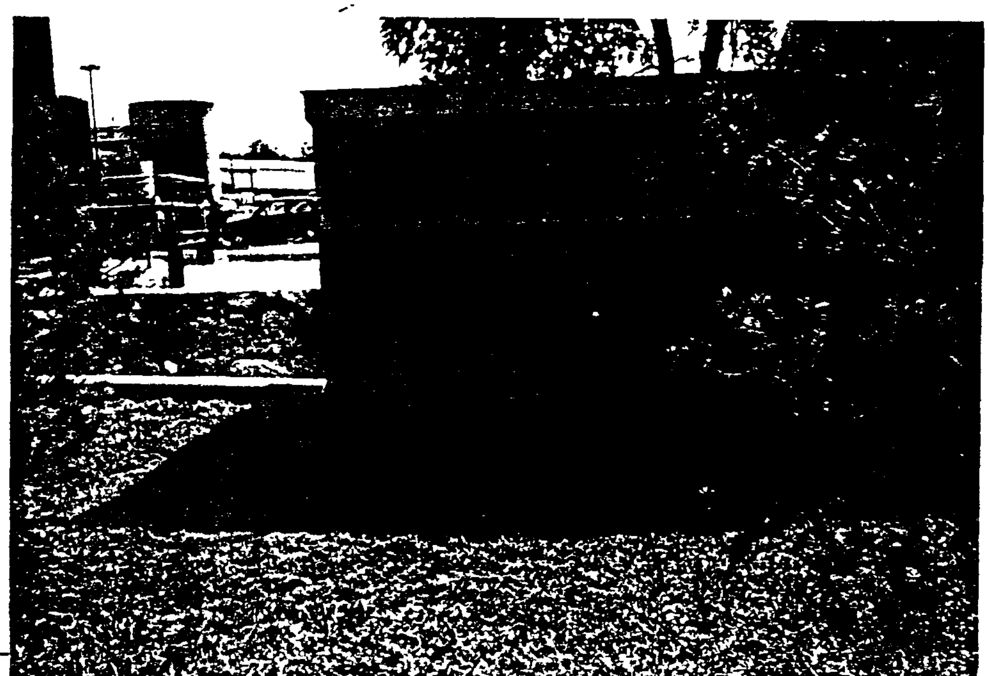
TIME: 1100

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW3



DESCRIPTION: This photograph shows surface water sample SW3 distant.

MEN02069

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: M'NASHA CORPORATION PAGE 20 OF 25

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1101

DIRECTION OF PHOTOGRAPH: Southeast

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW3

DESCRIPTION: This photograph shows surface water sample SW 3 point of discharge.

MEN02070

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 21 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1125

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW4

DESCRIPTION: This photograph shows Surface water sample SW4 Close up.

DATE: 6/27/90

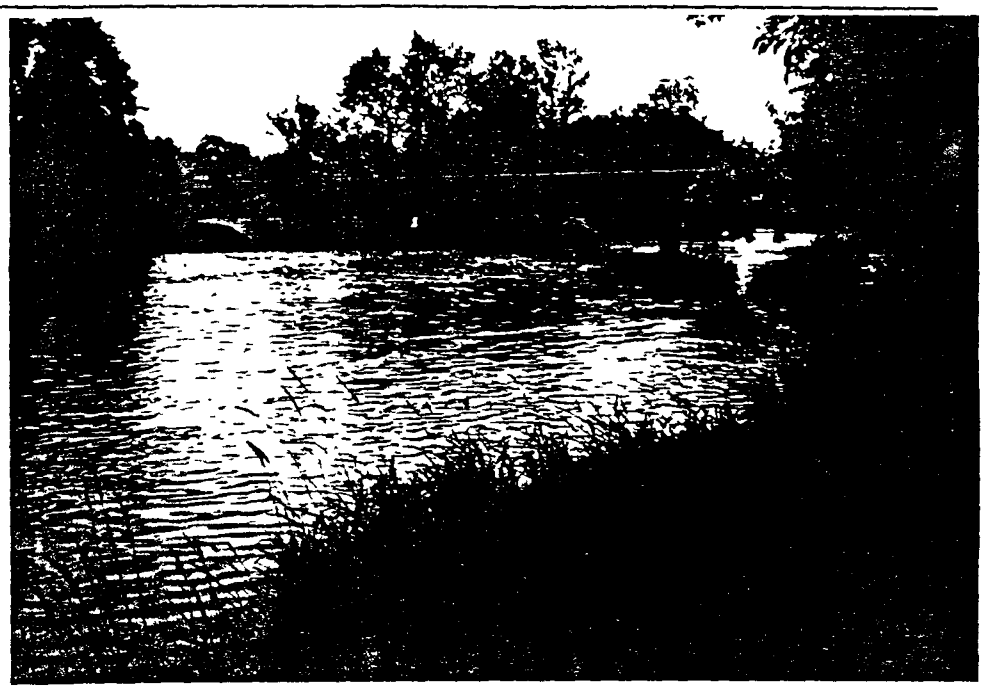
TIME: 1125

DIRECTION OF PHOTOGRAPH: Northeast

WEATHER CONDITIONS: Sunny, partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): SW4



DESCRIPTION: This photograph shows Surface water sample SW4 distant.

MEN02071

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 22 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1411

DIRECTION OF PHOTOGRAPH: Southeast

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows a vegetated area where ash and lime ponds were located.

DATE: 6/27/90

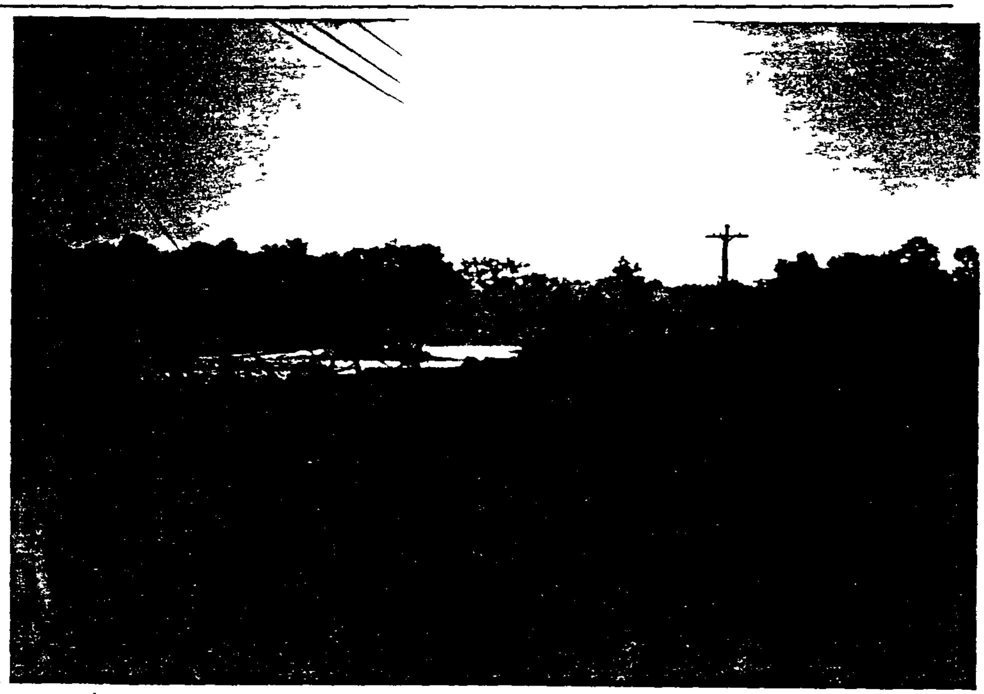
TIME: 1412

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA



DESCRIPTION: This photograph shows the aeration pond.

MEN02072

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 23 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

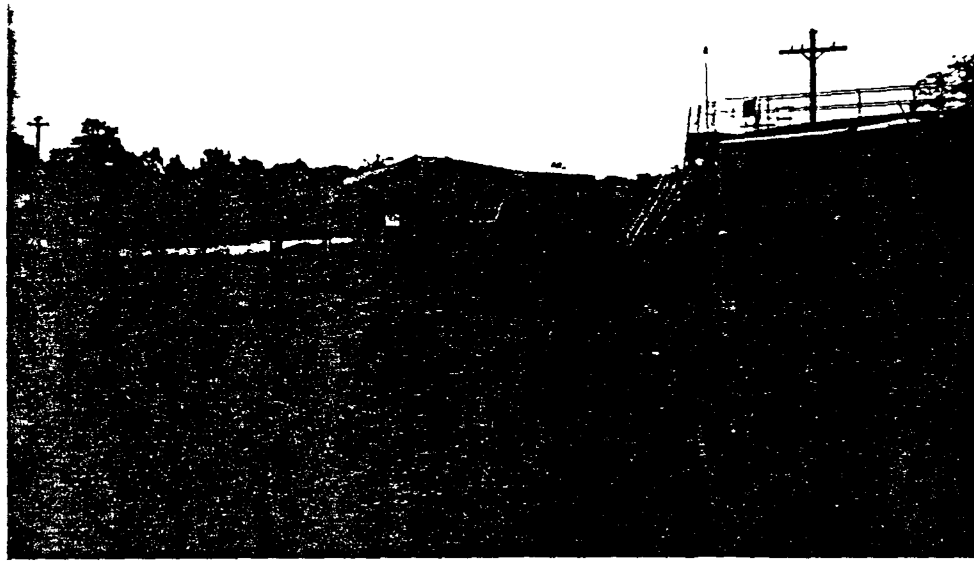
TIME: 1412

DIRECTION OF PHOTOGRAPH: Northeast

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA



DESCRIPTION: This photograph shows a clarifier, weir house and a settling pond.

DATE: 6/27/90

TIME: 1413

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows a settling pond and empty drums.

MEN02073

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 24 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1414

DIRECTION OF PHOTOGRAPH: West

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows the south side of the Main Plant building and the area of a spent liquor storage pond

DATE: 6/27/90

TIME: 1416

DIRECTION OF PHOTOGRAPH: Southeast

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows the Dam.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 25 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA

DATE: 6/27/90

TIME: 1417

DIRECTION OF PHOTOGRAPH: East

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows the south side of the Main Plant building and area.

DATE: 6/27/90

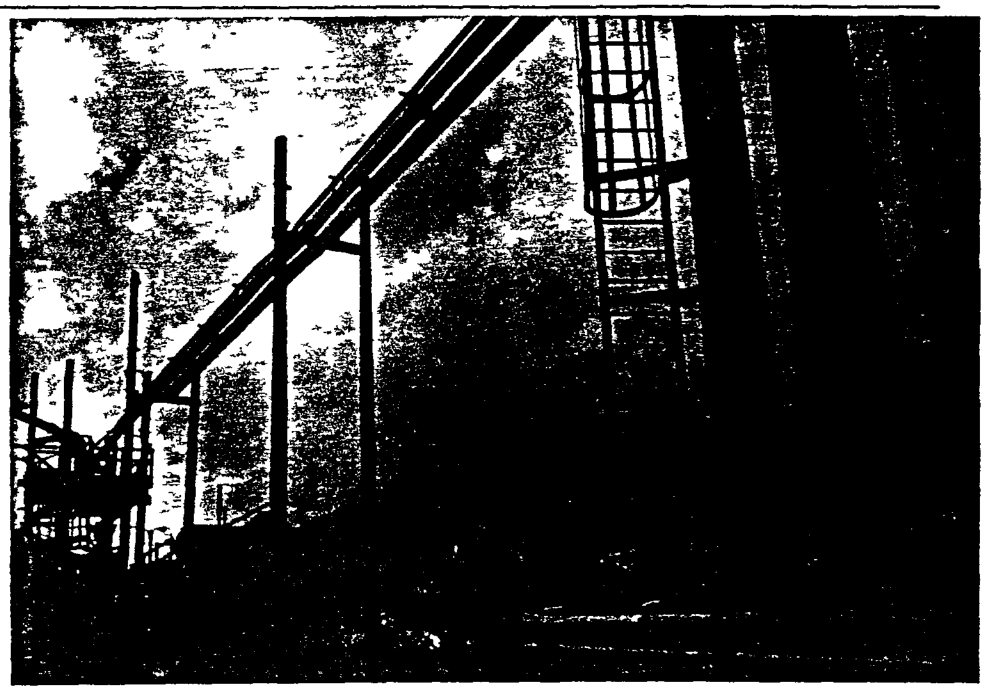
TIME: 1418

DIRECTION OF PHOTOGRAPH: North

WEATHER CONDITIONS: Sunny, Partly Cloudy ~69°F

PHOTOGRAPHED BY: Randy Livingston

SAMPLE ID (if applicable): NA

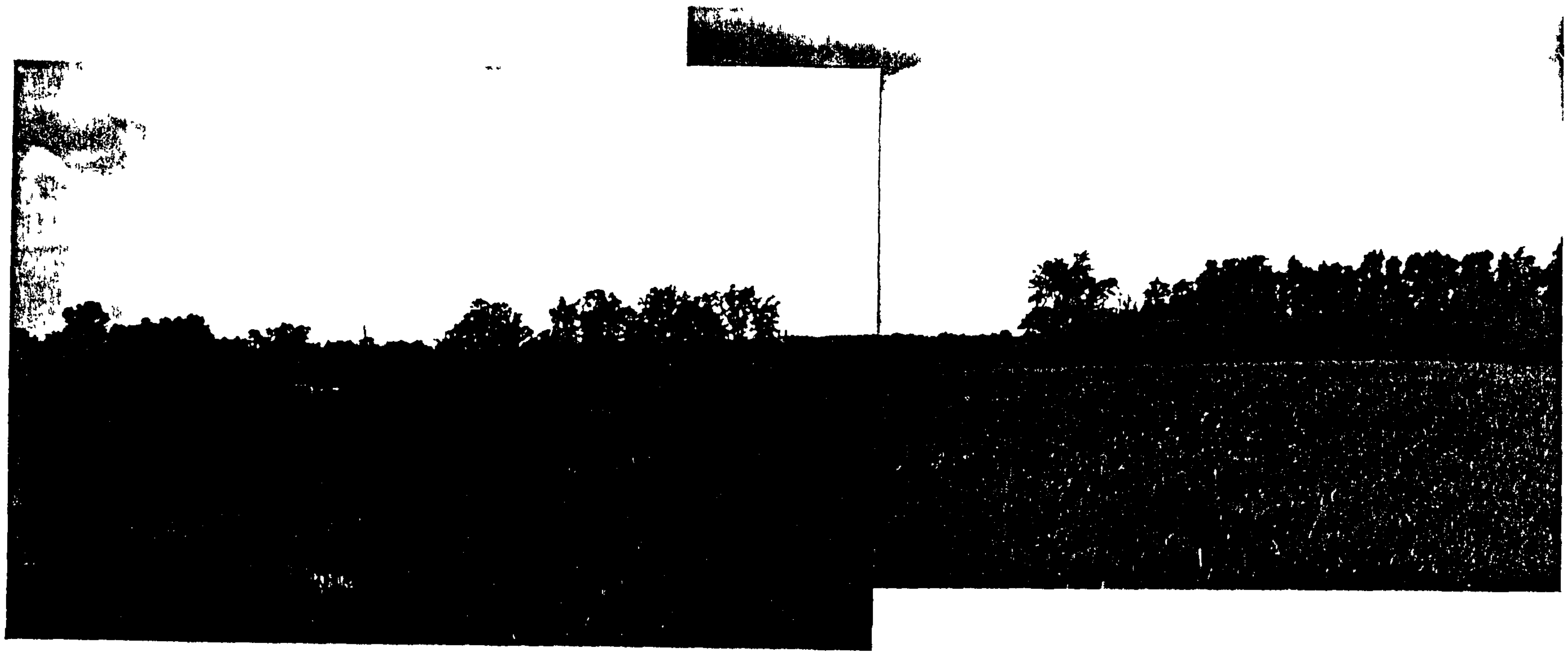


DESCRIPTION: This photograph shows the area where card board boxes and wood chips are stored.

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 26 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA



DATE: 6/27/90 TIME: 1329 DIRECTION OF PHOTOGRAPH: S.E PHOTOGRAPHED BY: Randy Livingston

WEATHER CONDITIONS: Sunny, partly Cloudy ~ 69°F SAMPLE ID (if applicable): NA

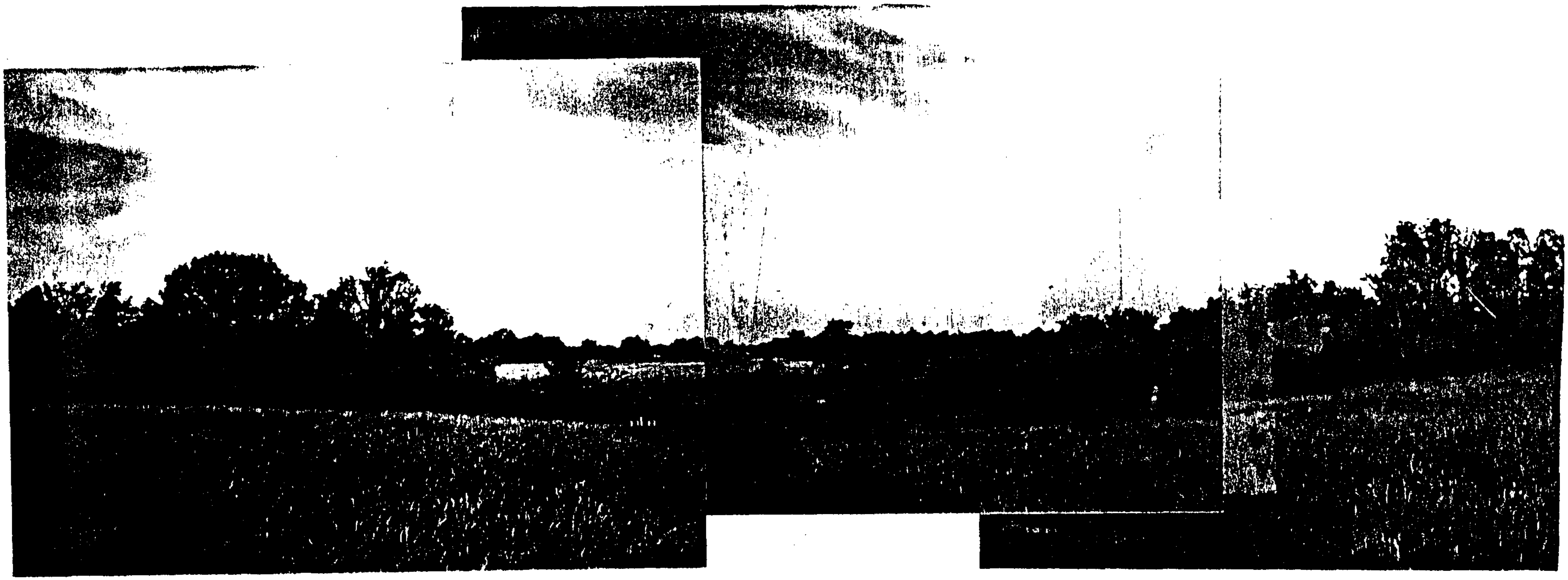
DESCRIPTION: This photograph shows a panorama picture of the Landfill.

MEN02075

FIELD PHOTOGRAPHY LOG SHEET

SITE NAME: MENASHA CORPORATION PAGE 27 OF 28

U.S. EPA ID: MID006012405 TDD: F05-9005-008 PAN: FMI0721SA



DATE: 6/27/90 TIME: 1330 DIRECTION OF PHOTOGRAPH: N + NE PHOTOGRAPHED BY: Randy Livingston

WEATHER CONDITIONS: Sunny, partly Cloudy ~ 69°F SAMPLE ID (if applicable): NA

DESCRIPTION: This photograph shows a Panorama picture of the Landfill and Farm land.

MEN02076

LIQUOR CONTAMINATION TO OTSEGO CITY WELLS

DOCUMENT #45

R

April 26, 1963

Michigan Water Resources Commission
200 Mill Street
Station B
Lansing 13, Michigan

Attention: Mr. Ralph Purdy

Gentlemen:

Confirming today's phone conversation, although the possibility of acquiring the City's wells is not permanently ruled out, we have not been able to negotiate such a purchase with them at this time. We therefore wish to request that the Commission proceed with all reasonable speed to process our request for the use of our eighty acre wood yard for spray disposal of our spent pulp mill liquor as we are unable to proceed with any building plans until we are sure of having a means of disposing of our liquid waste.

Sincerely yours,

MENASHA CORPORATION

George A. McConney
Administrative Supt.
km

3806

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

RALPH A. MAC MULLAN, Director

June 4, 1969

Mr. Joseph Cutro
General Manager
Paperboard Division
Manasha Corporation
P.O. Box 155
Otsego, Michigan 49078

Dear Mr. Cutro:

We appreciated the opportunity of meeting with the Company and representatives of the City of Otsego and the Michigan Department of Public Health on June 2, 1969, to discuss the possible effects of the Company's proposed new waste treatment facility on the City water supply, and to determine measures to be taken to insure the integrity of the supply.

It is understood that the Company will negotiate with the City of Otsego for the purchase of the two standby wells in question, and that the City will proceed to develop additional well capacity on City property at a site considered to have adequate isolation and other advantages which the site of the present standby wells does not presently provide.

Timing of the negotiations, and development of new well capacity, should be carefully planned and executed to coincide with the schedule for placing the new waste treatment facility in use. We will expect the City and the Company to work closely in a cooperative manner in this regard.

We will appreciate being kept closely informed of progress in this matter. If there are any questions, and if we can be of any further assistance to the Company and/or the City, we trust that there will be no hesitation to call upon us.

Very truly yours,

BUREAU OF WATER MANAGEMENT

Robert J. Courchaine

Robert J. Courchaine
Regional Engineer

RJC/sb
cc: W. A. Clark
G. E. Olivier
A. E. Slaughter
C. Harvey

MICHIGAN
THE GREAT LAKE STATE

1-L

MENASHA CORPORATION

MEN02080

Ken

PAPERBOARD DIVISION OTSEGO MICHIGAN 49078 • 616 • 692-6141

May 18, 1970

Mr. Wesley A. Clark
City Manager
City of Otsego
117 East Orleans
Otsego, Michigan 49078

Dear Mr. Clark:

We are attaching a letter quotation from Layne Northern Co. in which is contained the complete well installation including pump house, in house piping, auxiliary engine, connections to your existing No. 1 & 2 wells and necessary testing. These are in accordance with bid documents set forth by Williams & Works with changes suggested by Menasha, Layne Northern and Williams & Works but to produce approximately 1200 G P M at 190 T D H.

In previous meetings between the City, Board of Health and Menasha, it was agreed that the water quality was as good as or better than the City wells #1 & 2. We therefore propose to do the following:

1. Install well and equipment as outlined in the Layne Northern Proposal to provide water at the point of #1 & 2 well piping outlets. We would deed the portion of the land of the well installation to the City and the City of course will assume power, maintenance, etc. costs after placed into operation.

2. In lieu of the above, we will pay the City of Otsego $45,364.00 to develop a well at the location of their choice. We would then assume ownership of the wells #1 & 2 and all appurtances in either case.

3. We have paid the Engineering cost of well exploration and bid development at our proposed site, therefore any Engineering or other costs the city has incurred in investigating wells in other sections of the City would not be borne by Menasha Corporation.

FOUNDED 1849

We believe we have been fair in our evaluation of the complete situation and it goes without saying that the equipment proposed certainly will be in better operating condition than exists at wells #1 & 2.

We await your further word.

Very truly yours,

MENASHA CORPORATION

Joseph Cutro
General Manager

Encl. 2

c.c.	James K. Cleland	Dept. of Public Health
	Ed Burt	Williams & Works
	R. J. Courchaine	Water Resources Commission
	R. L. Johnson	Menasha Corporation

jk

Joe

MEN02082

Layne Northern Company, Inc.

WATER SUPPLY CONTRACTORS

WATER WELLS · VERTICAL PUMPS · WATER TREATMENT PLANTS

Offices
LANSING MICHIGAN
MISHAWAKA INDIANA
INDIANAPOLIS INDIANA

P. O. BOX 299
401 S. DELORENZI AVE.
MISHAWAKA, INDIANA
PHONE BLACKBURN 9-5234

January 3, 1963

Menasha Corp.
Otsego, Michigan

Att: Mr. Joseph Cutro, Plant Engineer

Gentlemen:

We are enclosing a booklet containing driller's logs as submitted by B. J. Lewis and Sons on the five recently completed test wells for your ground water flow study. Also included are the sieve analysis conducted in our laboratory on the samples submitted by Lewis. We are taking the liberty of sending one copy of this data to W. G. Keck and Associates of East Lansing.

As you will note, we have not given exact locations for these test wells and I believe some of them were changed from the sites originally suggested by Dr. Keck. Since we do not have this exact information we would appreciate receiving a copy of the location map from you, and I am sure Dr. Keck would also like to have a copy of this.

We would like to comment in passing that you have an exceptional ground water supply available to you on this property. From our review of the test well data, it appears as though 1000 to 1500 GPM wells could be located here, and also appears as though the area would support 2 or 3 wells of this size and production.

If we can be of further help to you in any way, in this special ground water flow study, we would be pleased to hear from you.

Very truly yours,

LAYNE NORTHERN COMPANY, INC.

R J Williams

R. J. Williams

RJW:c
Encl
cc: Dr. Keck

2026

P.O. BOX 299 MISHAWAKA, IND. 46544 PHONE: (219) 259-5234
INDIANAPOLIS • MISHAWAKA • LANSING

Layne NORTHERN COMPANY, INC. WATER SUPPLY CONTRACTORS

May 7, 1970

Menasha Corp.
Paperboard Division
Otsego, Michigan

Attention: Mr. Joseph Cutro, Plant Mgr.

Gentlemen:

Re: Proposed City Well

In accordance with your request we submit the following alternates for the proposed City well installation.

CONTRACT #1

Item 12 - Pump

Reduce TDH from 200' to 190'. This would allow for use of a 75 HP motor in place of a 100 HP and a smaller combination gear drive.
Total Savings - $785.00

Item 13 - In-House Piping

Reduce size of pipe, valves, meter and fittings from 10" to 8".
Total Savings- $873.00

Item 14 - Auxiliary Engine

Use a Ford Model 240 industrial power unit with 80 HP continuous duty rating at 2700 RPM and a 3:2 gear drive ratio to provide 1800 RPM on pump.
Total Savings -$2,345.00

Item 9A - Eliminate Air lift development.

This is not normally required with a gravel wall type well.
Total Savings -$168.00

Item 9b - Reduce development time from 16 to 8 hours.
Total Savings- $168.00

Total Savings for all rǝquested alternates to Contract #1 $4,339.00

Total revised Contract #1 price using above alternates - - - $25,362.00

CONTRACT #2

Pump House - For use of a Layne type B concrete block pump house with specified dimensions and concrete roof. Total savings- - - - - -$2,171.00

Total revised contract #2 price using this alternate- - - - - - -$7,699.00

CONTRACT #3

We are unable to improve on the bid of Southwest Gravel Company of $16,643.00, however, you have indicated that total footage will be approximately 1650' rather than 2270 feet. This would result in an estimated savings of $4,340.00 for a total final price of - - - - - - - - - - - - - - - -$12,303.00

Actual 1500

Total price for all three contracts as above detailed would therefore be -$45,364.00.

1141.00

Very truly yours,

LAYNE NORTHERN COMPANY, INC.

R. J. Williams

R. J. Williams

RJW:c

COPY

OTSEGO CHAMBER OF COMMERCE

P. O. Box 173
OTSEGO, MICHIGAN

COPY

MEN02085

November 14, 1969

Otsego City Commission
117 E. Orleans Street
Otsego, Michigan 49078

Dear Commissioners:

The Otsego Chamber of Commerce has been approached to give an opinion in regard to the relocation of city water wells and the subsequent problems involved.

We feel that the Menasha Corporation has been a victim of state bureaucracy and they acted in good faith. Menasha received the approval of both the Water Resources Commission and the Board of Health before beginning construction of the aeration ponds.

We all recognize the benefits of industry; such as, providing jobs, increasing retail sales, and providing a larger tax base, which lowers taxes to the individual property owner. Therefore, we hope the city will consider revising the assessing policy of making the property owner entirely assessable for sewer and water costs in all cases.

The city has shown great foresight in the past by cooperating with industry in assuming a portion of the cost of water and sewer improvements in such cases as: Thomas Paper Stock, Advance Meter, and Hammond Machinery Builders.

Favorable action by the city in this matter will give the Chamber of Commerce a powerful selling tool in attracting future industry to our community, in this era of fierce competition for industry.

Perhaps the city might investigate the possibility of a federal grant; because of the fact that one governmental agency authorized the project, while another condemned it.

The city's portion of the project cost will eventually be offset in the form of additional taxes paid by the Menasha Corporation.

COPY

MEN02086

In summary, we hope the city will receive this opinion with an open mind and act in the fair manner characteristic of the City of Otsego.

Respectfully,

OTSEGO CHAMBER OF COMMERCE

A. C. Cooper

A. C. Cooper, President

D. G. Nulty, Vice-President

C. A. Toaz, Treasurer

R. Y. Barrow, Secretary

R. Y. Barrow

A. E. Applegate, Director

N. Breedveld, Director

N. Breedveld

C. Covault, Jr., Director

Clyde Covault Jr

C. R. Cushman, Director

C. R. Cushman

H. De Good, Director

E. T. Lacey, Director

G. Nulty, Director

Greg Nulty

ACC:pa

2032

WATER WELL RECORD

MEN02087 12

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
allegan	otsego	N.E.NE.SW	35	1 N/S	12 W.

Distance And Direction from Road Intersections: 4/10 mile S of 102 Nd ave on 14th St

Street address & City of Well Location: R# 2 14th St otsego mich

Locate with "X" in section below — Sketch Map: 49078

102 Nd ave

14th St

100' X

3 OWNER OF WELL: Richard Hartmann

Address: 120 E allegan St otsego, Mich

4 WELL DEPTH (completed): 34 ft. Date of Completion: Sept 11 - 72

5
☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE:
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐

Diam. 2 in. to 26 ft. Depth
1¼ in. to 3'8" ft. Depth

Height: Above/~~Below~~ Surface 1 ft.
Weight 3.75 lbs./ft.
Drive Shoe? Yes ☒ No ☐

8 SCREEN:
Type: Stainless Dia.: 1¼"
Slot/~~Gauze~~ 10 Length 4'
Set between 30 ft. and 34 ft.
Fittings: 2 - 1¼" cuplings - 3'8" Set Link

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown clay	6'	6'
Blue clay	24'	30'
Sand & Gravel	4'	34'

USE A 2ND SHEET IF NEEDED

9 STATIC WATER LEVEL
10 ft. below land surface

10 PUMPING LEVEL below land surface
20 ft. after 1 hrs. pumping 10 g.p.m.
20 ft. after 1 hrs. pumping 10 g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Not Chloride (Cl) Known
Hardness ____ Other ____

12 WELL HEAD COMPLETION:
☐ In Approved Pit
☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
Septic tank Not in — Feet — Direction — Type
Well disinfected upon completion ☒ Yes ☐ ~~No~~ Yet

15 PUMP:
☒ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
18
ADDED INFO. BY DRILLER, ITEM NO.
CORRECTED BY:
ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Bakers Well Drilling — 0488
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood St Otsego, Mi

Signed Rip Baker — AUTHORIZED REPRESENTATIVE — Date Sept 11-72

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

MEN02088

al

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

11

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	NE.SW.SW.	24	1 N/S	12 E/W

Distance And Direction from Road Intersections: 7/10 mile N of M 89 on Plainwell Dam Rd

Street address & City of Well Location: Plainwell Dam Rd Otsego, Mich

Locate with "X" in section below — Sketch Map: 50' X — Plainwell Dam Rd — M 89

1 MI. — 1 MILE

3 OWNER OF WELL Consumers Ready Mix Concrete Co.

Address: Nazareth Rd Kalamazoo, Mich

4 WELL DEPTH: (completed) 68 ft. Date of Completion: Sept 7-72

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☒ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☒ Ready-Mix Plant

7 CASING. Threaded ☒ Welded ☐ Height: Above Surface 1 ft.

Diam. 4 in. to 58 ft. Depth — Weight 10.79 lbs./ft.

4 in. to 58 ft. Depth — Drive Shoe? Yes ☒ No ☐

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand & Gravel & Brown Cl[illegible]	18'	18'
Sand & Gravel	50'	68'

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: Stainless Dia.: 3 1/2

Slot/Gauze 10 Length 8 1/2'

Set between 58 ft. and 68 ft.

Fittings: 1 of 3" coupling / Rubber [illegible] / 1-1 1/4" [illegible]

9 STATIC WATER LEVEL 32 ft. below land surface

10 PUMPING LEVEL below land surface

50 ft. after 1 hrs. pumping 80 g.p.m.

50 ft. after 1 hrs. pumping 80 g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Not Chloride (Cl) Known

Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No

☐ Neat Cement ☐ Bentonite ☐ ______

Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination

85 feet N.E. Direction Septic Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☒ Not installed

Manufacturer's Name ______

Model Number ______ HP ____ Volts ______

Length of Drop Pipe ______ ft. capacity ______ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Baker Well Drilling — 0488

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood St. Otsego, Mich

Signed Roger Baker — AUTHORIZED REPRESENTATIVE — Date Sept 11-72

D67d 100M (Rev. 12-68)

20

APR 16 1976

WATER WELL RECORD

Act 294 PA 1965

MEN02089

9

PUBLIC HEALTH

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	NE 1/4 SE 1/4	23	1N N/S.	12W E/W.

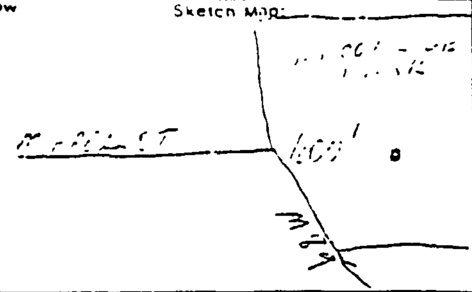
Distance And Direction from Road Intersections

600 ft. NE of Road 89 & Morrell St.
In Brookside Park - Otsego, Mich.

Street address & City of Well Location

Locate with "X" in section below — 1 MILE — 1 MI.

Sketch Map:



3 OWNER OF WELL:

City of Otsego

Address: 117 East Orleans
Otsego, Michigan 49078

4 WELL DEPTH: (completed)

115 ' ft. Date of Completion: July, 1975

5

☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE:

☐ Domestic ☒ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING:

Threaded ☐ Welded ☒

Diam. 16 in. to 85 ft. Depth
in. to ft. Depth

Height: Above/Below Surface 1 above ft.
Weight lbs./ft.
Drive Shoe? Yes ☐ No ☒

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Fill	0	5
Medium Sand	5	20
Soft Brown clay	20	22
Fine sand	22	36
Coarse sand and gravel	36	40
Coarse sand and gravel w/boulders	40	45
Medium sand and gravel	45	60
Coarse sand w/some gravel	60	95
Coarse sand w/boulders	95	113
Clay	113	115

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: Stainless Steel Dia.: 12" P.S. 16" RS
Slot/Gauze 35 Length 30'
Set between 85 ft. and 115 ft.
Fittings: Welded

9 STATIC WATER LEVEL

12 ft. below land surface

10 PUMPING LEVEL below land surface

35 ft. after 2 hrs. pumping 1000 g.p.m.
ft. after hrs. pumping g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) Chlorides (Cl)
Hardness Other

12 WELL HEAD COMPLETION:

☐ In Approved Pit
☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted?

☒ Yes ☐ No
☒ Neat Cement ☐ Bentonite ☐
Depth: From 0 ft. to 35 ft.

14 Nearest Source of possible contamination

feet Direction Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP:

☐ Not installed
Manufacturer's Name Deming
Serial Model Number I-75112 HP 40 Volts 460
Length of Drop Pipe 40 ft. capacity 600 G.P.M.
Type: ☐ Submersible
☐ Jet ☒ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER. ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Dunbar Drilling Inc. REGISTERED BUSINESS NAME — 0163 REGISTRATION NO.

Address 307 Broadway, Swanton, Ohio 43558

Signed AUTHORIZED REPRESENTATIVE Date 3-31-76

Dale D. ...

Go7d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE NO.

MEN02090

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

7

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	S.W. S.W. N.E.	13	1 N./S.	12 E./W.

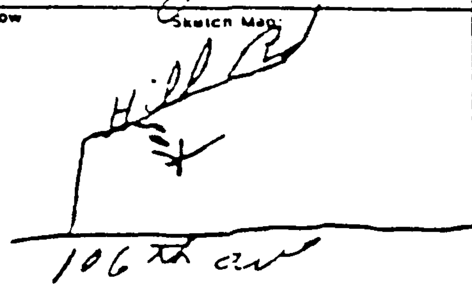
Distance And Direction from Road Intersections: 3/10 Mile East of 106th ave on Hill Rd

Street address & City of Well Location: 1372 Hill Rd Otsego, mich

Locate with "X" in section below — Sketch Map:

X

1 MILE



3 OWNER OF WELL:

Owen L Davis

Address: 115 [illegible] St.

Otsego Mich 49078

4 WELL DEPTH: (completed)

53 ft. Date of Completion: June 5 - 72

5

- [ ] Cable tool
- [ ] Rotary
- [ ] Driven
- [ ] Dug
- [x] Hollow rod
- [ ] Jetted
- [ ] Bored
- [ ]

6 USE:

- [x] Domestic
- [ ] Public Supply
- [ ] Industry
- [ ] Irrigation
- [ ] Air Conditioning
- [ ] Commercial
- [ ] Test Well
- [ ]

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand & Gravel	11'	11'
Sand & Gravel & Brown Clay	7'	18'
Blue Clay & Gravel	30'	48'
Fine & Coarse Sand	5'	53'

USE A 2ND SHEET IF NEEDED

7 CASING.

Threaded [x] Welded [ ]

Diam.

2 in. to 49 ft. Depth

2 in. to 49 ft. Depth

Height: Above/~~Below~~ Surface 1 ft.

Weight 3.65 lbs./ft.

Drive Shoe? Yes [x] No [ ]

8 SCREEN:

Type: Cleaned — Dia.: 1 1/4"

Slot/~~Gauge~~ 10 — Length 4'

Set between 49 ft. and 53 ft.

Fittings: 1-1 1/4" coupling

9 STATIC WATER LEVEL

23 ft. below land surface

10 PUMPING LEVEL below land surface

45 ft. after 1 hrs. pumping 10 g.p.m.

45 ft. after 1 hrs. pumping 10 g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) NOT Chloride (Cl) KNOWN

Hardness ______ Other ______

12 WELL HEAD COMPLETION:

- [ ] In Approved Pit
- [ ] Pitless Adapter
- [x] 12" Above Grade

13

Well Grouted? [ ] Yes [x] No

- [ ] Neat Cement
- [ ] Bentonite
- [ ]

Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination

80 feet S.W. Direction Septic Type

Well disinfected upon completion [x] Yes [ ] No

15 PUMP:

[x] Not installed

Manufacturer's Name ______

Model Number ______ HP ____ Volts ______

Length of Drop Pipe ______ ft. capacity ______ G.P.M.

Type: [ ] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[illegible] Drilling 0458

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 [illegible]

Signed [illegible] — AUTHORIZED REPRESENTATIVE — Date June 5 - 72

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY SAMPLE No

MEN02091

WATER WELL RECORD

ACT 294 PA 1965

DEPT. OF PUBLIC HEALTH

SW, SE, SW 14

1 LOCATION OF WELL

County	Twp. & City or Village	Fraction	Section No.	Town	Range
ALLEGAN	OTSEGO	¼ ¼ ¼	14	1 N/S	12 E/W

Distance And Direction from Road Intersections: 650' East of Farmer St, 210' North of River St

Street address & City of Well Location

OWNER No.

3 OWNER OF WELL: Menasha Corporation

Address: Otsego Mich

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel & clay	50'	50'
Sand yellow fine	20'	70'
Stones	2'	72'
Clay & stones	6'	78'
Gravel water bearing	12'	90'
10 feet below screen		
is gray water		
bearing sand		
fine		

4 WELL DEPTH: (completed) 90 ft. Date of Completion Feb 1 - 1968

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☒ Jetted ☐ Bored ☐

6 USE ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Diam. 4 in. to 84 ft. Depth; ___ in. to ___ ft. Depth. Height Above/Below surface 1 ft. Weight ___ lbs/ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type Cook Dia.: 3" Slot/Gauze 10 slot Length 6 feet Set between 84 ft. and 90 ft. Fittings: lead packer & bail bottom

9 STATIC WATER LEVEL 40 ft. below land surface

10 PUMPING LEVEL below land surface 82 ft. after 3 hrs. pumping 25 g.p.m. ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☒ No Material: ☐ Neat Cement ☐ ___ Depth: From ___ ft. to ___ ft.

14 SANITARY: Nearest Source of possible contamination 700 feet South Direction River Type. Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: Manufacturer's Name Tait Model Number 810L47 HP 1 Length of Drop Pipe 76 ft. capacity 25 G.P.M. Type: ☒ Submersible ☐ Jet ☐ ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
ADDED INFO. BY DRILLER, ITEM NO.
CORRECTED BY: RR
ADDITION BY: RT

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Lyle Ayers — REGISTERED BUSINESS NAME
0473 — REGISTRATION NO.
Address: Martin Mich
Signed: Lyle Ayers — AUTHORIZED REPRESENTATIVE. Date 2/1/68

0570 100M 6-66 MAY 29 1968

GEOLOGICAL SURVEY COPY

MEN02092

2

WATER WELL RECORD

ACT 294, PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	¼ ¼ ¼	11	1 N/S	12 E/W

Distance And Direction from Road Intersections: 3/10 M N of 108TH AVE ON 16TH ST

Street Address & City of Well Location: 899 N 16Th Otsego, Mich

Locate with "X" in section below — X

Sketch Map: 16TH ST, 120 X, 108TH AVE

3 OWNER OF WELL: David Keith

Address: 899 N 16Th Otsego, Mich

4 WELL DEPTH (completed): 112 ft. Date of Completion: Sept 4 - 76

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING. Threaded ☒ Welded ☐ Diam.

2 in. to 105 ft. Depth
2 in. to 105 ft. Depth

Height: Above/Below Surface 1 ft.
Weight 3.75 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Stones-Sand Gravel & Brown clay	36'	36'
Quick Sand & Blue Clay	69'	105
Fine Sand	7'	112'

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Stainless Dia.: 1¼"
Slot/Gauze 10 Length 7
Set between 105 ft. and 112 ft.
Fittings: 1¼" Cup

9 STATIC WATER LEVEL
60 ft. below land surface

10 PUMPING LEVEL below land surface
60 ft. after 1 hrs. pumping 12 g.p.m.
60 ft. after 1 hrs. pumping 12 g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Not Chloride (Cl) Known
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
25 feet NW Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name Tait
Model Number 10E7 HP 1 Volts 230
Length of Drop Pipe 84 ft. capacity ____ G.P.M.
Type: ☐ Submersible ☒ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION.
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Baker Well Drilling 0488
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 300 Sherwood St Otsego

Signed [signature] AUTHORIZED REPRESENTATIVE Date Sept 4-76

067d 100M (Rev. 12-68)

LOCAL HEALTH DEPT. COPY

WELL 6

1970

WATER WELL RECORD

ACT 294 PA 1965

NW ?

MEN02093

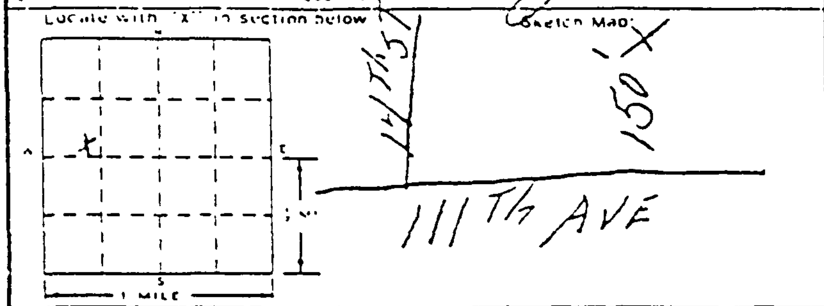
PUBLIC HEALTH

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Allegan	Otsego	¼ ¼ ¼	1	1 N/S.	12 E/W.

Distance And Direction from Road Intersection: 2½/10 Mile W of 14th St on 111th Ave

Street Address & City of Well Location: RR#1 - 111th Ave Otsego Mich



3 OWNER OF WELL: Robert Lester

Address: 1099 - 10th St, Martin Mich

4 WELL DEPTH: (completed) 79 ft. Date of Completion: Aug 25 - 76

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☒ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Height: Above/Below Surface 1 ft.
Diam.
2 in. to 75 ft. Depth Weight 3.75 lbs./ft.
2 in. to 75 ft. Depth Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Stones & Gravel	12'	12'
Brown clay sand & gravel	24'	36'
Sand & Gravel	43'	79'

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Strainer Dia.: 1¼"
Slot/Gauze: 10 Length: 4'
Set between 75 ft. and 79 ft.
Fittings: 1¼" cupling

9 STATIC WATER LEVEL
54 ft. below land surface

10 PUMPING LEVEL below land surface
54 ft. after 1 hrs. pumping 12 g.p.m.
54 ft. after 1 hrs. pumping 12 g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) Not Chlorides (Cl) Known
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
Septic Not in Yet — Feet, Direction, Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name: Tait
Model Number: 10E2 HP 1 Volts 230
Length of Drop Pipe 63 ft. capacity 10 G.P.M.
Type: ☐ Submersible
☒ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
CORRECTED BY
ADDITION BY
ELEVATION
DEPTH TO ROCK

dw

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Bakers Well Drilling — 0488
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address: 300 Sherwood St Otsego

Signed: Rip Baker Date: Aug 26 - 76
AUTHORIZED REPRESENTATIVE

067d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

PAPERBOARD DIVISION OTSEGO MICHIGAN 49078 • 616 • 692 6141

May 13, 1974

Roger Przbysz
Basin Water Quality Investigator
Water Resources Commission
4056 Plainfield Ave. N.E.
Grand Rapids, Michigan 49505

Dear Roger:

In response to your inquiry regarding Menasha's approach to solving well water contamination problem on 106th Ave, I am submitting the following outline of action.

1. In the short term, activated charcoal filtration unit is being installed on Geren's residence well water to improve condition so that it may be used for washing purposes. Water cooler is being provided to hold drinking water. These two improvements should be completed today.

2. Menasha has sent inquiry to Wes Clark of City of Otsego regarding installing city water down 106th Ave.

3. We are contacting those residences which may have a well water discoloration problem to sample their water.

4. Spray disposal of Clarifier sludge is being implemented as quickly as possible to improve dispersion of sludge and eliminate possible seepage into the aquifer of liquid from sludge.

I believe that the above outline covers what you require.

Yours Sincerely,
Norman E. Johnstone

Norman E. Johnstone
Technical Superintendent W-792

jm

cc: Dick Thorne
Allen Schenck
E. C. Manders

MEN02095

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
A. GENE GAZLAY, Director

WATER RESOURCES COMMISSION
4056 Plainfield Avenue, N. E.
Grand Rapids, Michigan 49505

June 4, 1974

Mr. Norman Johnstone,
Technical Supervisor
Menasha Corporation
Otsego, Michigan 49078

Dear Mr. Johnstone:

Listed below are the analytical results of samples taken on May 22, 1974 from the suspected contaminated wells on 106th Avenue:

	Menasha Corp. Sludge Supernatant	Gren Well	Thornton Well	Dayton Well
Tannin & Lignin	≈5	≈2	≈0.2	≈0.1
SO4	Interference	470	84	36
Mg	13	67	28	28
Fe	28	8.0	0.50	1.5
Zn	0.30	2.7	0.70	0.60
Color	6500	2000	75	10
pH	8.3	7.6	7.7	7.6

(Concentrations are expressed in mg/l, except pH and color)

The sample results support our previous conclusions. Your letter of May 13, 1974 outlined Menasha's course of action to solve this well water degradation.

I am sure you will keep us informed regarding the developments on the installation of city water down 106th Avenue.

Very truly yours,

WATER RESOURCES COMMISSION

Roger Przybysz

Roger Przybysz,
Water Quality Investigator

RP/mc
cc: Karl Zollner

MICHIGAN
THE GREAT LAKE STATE

1419

MEN02096

WILLIAMS & WORKS

ENGINEERS — SURVEYORS — PLANNERS

LABORATORY DEPARTMENT

Water - Waste Water - Soils

Client: Menasha

Monitoring Wells

7/6/73

Project No. P 79747

Date: 16 July 1973

Chemist: FLK & AES

SAMPLE

	Well #1	Well #2	Well #3			
Alkalinity	290 mg/l	906 mg/l	330 mg/l			
ıloride	2 mg/l	10 mg/l	5 mg/l			
Hardness	330 mg/l	360 mg/l	300 mg/l			
Ammonia Nitrogen	0.0 mg/l	2.1 mg/l	0.0 mg/l			
Nitrate Nitrogen	1.5 mg/l	6.8 mg/l	0.8 mg/l			
Total Kjeldahl Nitrogen	1.1 mg/l	4.2 mg/l	1.4 mg/l			
Chemical Oxygen Demand	8.0 mg/l	360 mg/l	44 mg/l			
pH	7.7	7.6	7.7			
Phosphorus, Total	0.26 mg/l	0.16 mg/l	0.32 mg/l			
Specific Conductance	560 umhos	1650 umhos	520 umhos			
Sulfate	35 mg/l	13 mg/l	20 mg/l			

1421

MEN02097

WILLIAMS & WORKS

ENGINEERS — SURVEYORS — PLANNERS

LABORATORY DEPARTMENT

Water - Waste Water - Soils

Client: Menasha

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7/6/73

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ıloride	2 mg/l	10 mg/l	5 mg/l			
Hardness	330 mg/l	360 mg/l	300 mg/l			
Ammonia Nitrogen	0.0 mg/l	2.1 mg/l	0.0 mg/l			
Nitrate Nitrogen	1.5 mg/l	6.8 mg/l	0.8 mg/l			
Total Kjeldahl Nitrogen	1.1 mg/l	4.2 mg/l	1.4 mg/l			
Chemical Oxygen Demand	8.0 mg/l	360 mg/l	44 mg/l			
pH	7.7	7.6	7.7			
Phosphorus, Total	0.26 mg/l	0.16 mg/l	0.32 mg/l			
Specific Conductance	560 umhos	1650 umhos	520 umhos			
Sulfate	35 mg/l	13 mg/l	20 mg/l			

1422

FORM NO. 561

3/13/73

MEN02098

memo / MENASHA CORPORATION

TO: Dick Thorne

DATE: 3/13/73

SUBJECT: Wright's Well - Meeting with County Public Health Department.

FROM: K. E. Lowe

1. An informal meeting was held with Mr. Jeff Lubbers of the Allegan County Public Health Department to discuss the contamination problems with the Wright's Well. The following attended: D. Thorne
   N. Johnstone
   K. E. Lowe

2. The Company told Mr. Lubbers that it was our intent to provide the Wright's with a safe water supply. This satisfied the County man and we agreed to work directly with the Wrights but keep the County informed on what approaches are taken. Two approaches are planned:

   - Short Term: To provide water to the house from Wright's barn well. This is now being done and should be complete by March 16, 1973. A Culligan color removal unit is also being installed on this well.

   - Long Term: To provide City well to the Wright's house. This means running a water main under the Penn Central lines and for a distance of about 1000 feet. The approval of City and County agencies is required for this approach.

3. Mr. Lubbers also asked if we knew of any other contaminated wells in this area and if we had sampled any of the private wells on 106th Street. We replied no to both questions. He felt we should periodically monitor the other private wells for contamination. We told him that part of the Williams and Works Survey was to make recommendations on water monitoring and we would probably be monitoring the ground water in this area.

4. It is important to realize in analyzing these problems that liquor and white water seepage has been occurring for a number of years. Contamination has been picked up in #3, #6, and #7 wells for at least 3 years. Therefore, it is likely that the ground water at the houses on 106th Street could be contaminated. If this occurs we will be obligated to pipe City water to these homes.

cc: N. Johnstone
    A. Brindley

js

memo / MENASHA CORPORATION

MEN02099

TO: Dick Thorne

DATE: December 3, 1975

SUBJECT: 1974 Well Water Treatment Program, Calgon.

FROM: Bruce Buchanan

cc: E. C. Manders
A. Schenck
N. Johnstone
J. Scott
Lab (3)

History of Contamination of the Aquifer

The sand and gravel base aquifer from which we draw our water at No. 6 & 7 wells has a southwesterly travel of approximately one (1) foot per day. This aquifer seems also to be part of the source of No. 4 & 5 wells. To the east and northeast, several sources of contamination were established during 1973. The approximate chronolgy of events is as follows:

A. Sludge
1. Began shallow ponding of sludge early summer 1973.
2. Began deep diked ponding of sludge August 1973.

B. Liquor
1. Hauled about 1.4 mm gallons of liquor to southwest gravel liquor pond from mid March to mid April. *
   * During the time hauling was being done, it was noted that after the pond reached a certain level, it remained at that level even though approximately 50,000 gallons per day were being brought into pond. This type of leaching indicates a probable significant source of ground water contamination.
2. Hauled out of southwest gravel pond during June.
3. Hauled about 1.0 mm gallons of liquor to southwest gravel from mid November to mid December.
4. Subsequently, only intermittant hauling of liquor to southwest occured as demanded by lack of space in mill pond.

These two sources of contamination provide distinctly separate problems, which have no simple solution.

The liquor contamination causes increased organic loading of the well water in the form of lignosulfonates. Lignosulfonates are themselves sources of food for numerous bacteria. The decomposition and partial decomposition products do not have the excellent dispersant properties of the original lignosulfonates and tend to form deposits, especially in areas of reduced flow such as in seal water lines. Heat also accellerates biodegredation (approximately double for each $10^{o}c$) thus the accentuated problems in heat exchangers.

The sludge ponding and subsequent leaching results in the influx of inordinately high levels of bacteria into the aquifer. These bacteria are, of course, particularly well acclimated to reduction of NSSC biodegradables.

MEN02100

Well water contamination has increased over the last year, and due to the slow mass movement of the aquifer, well water quality will most probably continue to degrade for some time to come.

Initiation of 6 Month Trial with Calgon

During the later part of 1973, as the well water became increasingly unmanageable and the Naleo 236 then being used was taxed beyond its capability, both Buckman Labs and Calgon Corporation were brought in to submit proposals for treatment programs. The Calgon program was chosen and the trial began in February of 1974.

Chronology of Calgon Treatment Program

A. Treatment began with CL-14 dispersant and H-130 biocide on February 26, 1974 at No. 4 & 5 wells and on February 7, 1974 at No. 6 & 7 wells. Feed Rate * set at 25 ppm 1 hr. per shift on biocide (H-130) and 10 ppm continuous on dispersant (Cl-14).
* See chart on Paramaters Affecting 003 Effluent B.O.D. for pounds feed per day.

B. H-204 Biocide used as substitute for H-130 because of lack of availability of H-130. H-204 fed from August 7 - September 20.

C. Week of October 24. Longer duration of feed reduced rate.

D. Week of October 30. Synchronization of all H-130 timers.

E. Week of November 24. Continuous feed at 3ppm.

F. November 29 - December 2. High dosage shock feed of biocide.

G. December 4 to year end. Substitute Cl-14 with Cl-36 wetting agent.

Results of Various Phases of Extended Trial

During the first few months of the Calgon treatment program, results looked encouraging. No really dramatic improvement in slime problems was noticed, but a significant reduction of iron floc plugging of filters was verified. Overall slime problems seemed to be held in check, or at least did not worsen. However, during the latter part of the year, control of slime associated problems deteriorated and, as can be seen in the Chronology Table, numerous modifications were made to the treatment program in a futile attempt to regain control over the worsening situation. None of these attempts showed any dramatic improvement in conditions except for item F, and this approach could not be economically justified, and in light of plate counts, this approach should not need to be taken. Listed below are the percent kill of bacteria on the indicated dates.

DATE	WELL NUMBER	PERCENT KILL
March 4	4,5,6 & 7	>99
May 29	4,5,6 & 7	>99
June 18	4,5,6 & 7	>99
October 16	4,5,6 & 7	>95
December 8	5,6 & 7	>99

MEN02101

Because of the improvement seen over the weekend cited under item F in the Chronology, item G was initiated. The reasoning being that a wetting agent fed just prior to biocide feed would help wet out the slime masses and allow the biocide more effective penetration. This approach needs more time to determine its efficacy.

Cost of Calgon Well Water Treatment Program

Listed below is the year's total and monthly average costs.

H-130	$1900.00/mo.
Cl-14	$1750.00/mo.
TOTAL	$3650.00/mo. or $44,000.00/year.

Conclusions and Recommendations

In view of the continuing deterioration of our current aquifer along with the inordinate costs incurred in this and most probably any other treatment program, an alternate source of water supply should be sought. River water, which is even now of far better quality than our well water may prove the most attractive alternate. Tests are currently being run by both Calgon and Buckman Labs to reveal the difference between well and river water with respect to both initial quality and overall treatment costs.

During the next few months a short extension of the Calgon program should be granted to fully evaluate the wetting agent approach. In the event this fails, a short trial should be made with the Buckman materials with a long term eye, however, toward an alternate source of supply, i.e. river water and chlorination.

BB/aa

Report

Project

Monitoring Well Installation
Otsego, Michigan

Summary of Drilling Services

Client

Menasha Corporation
Paperboard Division
320 Farmer Street
Otsego, Michigan 49078

Project #	71669XF
Date	December 30, 1987

STS Consultants Ltd.
Consulting Engineers

3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

MEN02103

STS Consultants Ltd.
Consulting Engineers
3340 Ranger Road
Lansing, Michigan 48906
(517) 321-4964

December 30, 1987

Mr. John Bonham
Menasha Corporation
Paperboard Division
320 North Farmer St.
Otsego, MI 49078

RE: Monitoring Well Installation. Otsego. Michigan
SUMMARY OF DRILLING SERVICES

Dear Mr. Bonham:

STS Consultants, Ltd. has completed drilling operations for the above referenced project. This work was authorized by your Purchase Order No. 4819950. This letter presents a summary of our services completed to date.

On December 2, 1987, an STS drill crew met your representative, Mr. Keith Kling, at the project site. STS commenced drilling operations upon reviewing boring locations as determined by Mr. Kling. A total of two (2) soil borings were completed utilizing hollow stem augers. Figure 1 illustrates the boring location diagram. Borings P-1 and P-2 were advanced to depths of approximately 47 and 43 feet, respectively. To permit the installation of monitoring well MW-P1, approval from Mr. Kling was obtained to use water within the hollow stem augers to equalize differential hydrostatic pressure at the bottom of the boring, and reduce soil intrusion into the base of the augers. Representative soil samples were obtained in the borings utilizing the split-barrel sampling procedure, in general accordance with ASTM specification D-1586. A brief description of this procedure is enclosed with this letter.

Clean protocol was followed during the drilling operations. This procedure included steam cleaning the rear portion of the drill rig. augers. and sampling tools prior to commencing drilling operations and between boring locations. Furthermore, split-barrel samplers were cleaned with trisodium phosphate between each sampling event.

The drill crew maintained field logs of the typed drilling operation. Each soil sample was given a brief classification by the drill crew and placed into a virgin sample jar. The drill crew's classifications are noted on the typed copy of the field logs enclosed with this letter. Soil samples were occasionally scanned with an HNU photo-ionization meter to detect the presence of volatile organic vapors. The STS drill crew did not encounter soils with positive vapor readings. However, a black material was found in the soil samples collected at depths ranging between approximately 35 to 41 feet below ground surface in Boring P-1. A representative sample of this material was given to Mr. Kling at the conclusion of the drilling operation.

Water level observations were performed during the drilling operation and at the completion of each soil boring. The water level observations are noted in the upper right corner of the boring logs.

Following completion of drilling operations, monitoring wells consisting of 2 inch diameter PVC casing and #10 slot PVC screens were set in each borehole. After the well was placed in the boring, a sand pack was placed around the screen. A layer of bentonite pellets approximately 2 feet thick was then placed above the sand pack and the annulus was backfilled to the surface with bentonite/cement grout. A protective steel casing with locking cap was then placed around the well. Copies of the field monitoring well installation diagrams are enclosed with this letter.

Finally, the STS survey crew obtained ground surface, top of PVC well casing, and top of protector pipe elevations for previously existing wells MW-1, MW-2 and MW-5 through MW-10, and new wells MW-P1 and MW-P2. The elevations are given in feet and are referenced to a benchmark described as "the north northwest flange bolt on the fire hydrant located at the northeast corner of River Street and Farmer Street." The elevation of this benchmark is noted as +719.34 feet. Table 1 presents ground surface and well casing elevations for the nine monitoring wells.

Table 1
Summary of Well Installation Data
Menasha Corporation, Otsego, Michigan

	Elevations (ft)		
Well Designation	Casing Top	Ground Surface	Protector Pipe Top
MW-1	722.40	723.1	723.1
MW-2	723.14	724.3	724.3
MW-5	728.14	728.9	728.9
MW-6	727.47	727.8	727.8
MW-7	695.38	695.4	695.4
MW-9	721.38	719.5	721.6
MW-10	721.48	719.4	721.5
MW-P1	730.78	728.5	730.5
MW-P2	743.05	740.0	742.7

We appreciated the opportunity to have been of service to you. If you have any questions regarding this letter, or desire additional field or engineering services, please do not hesitate to call at (517) 321-4964.

Sincerely,

STS CONSULTANTS, LTD.

William E. Holman

William E. Holman, P.E.
Senior Project Engineer

Dianne D. Borrello

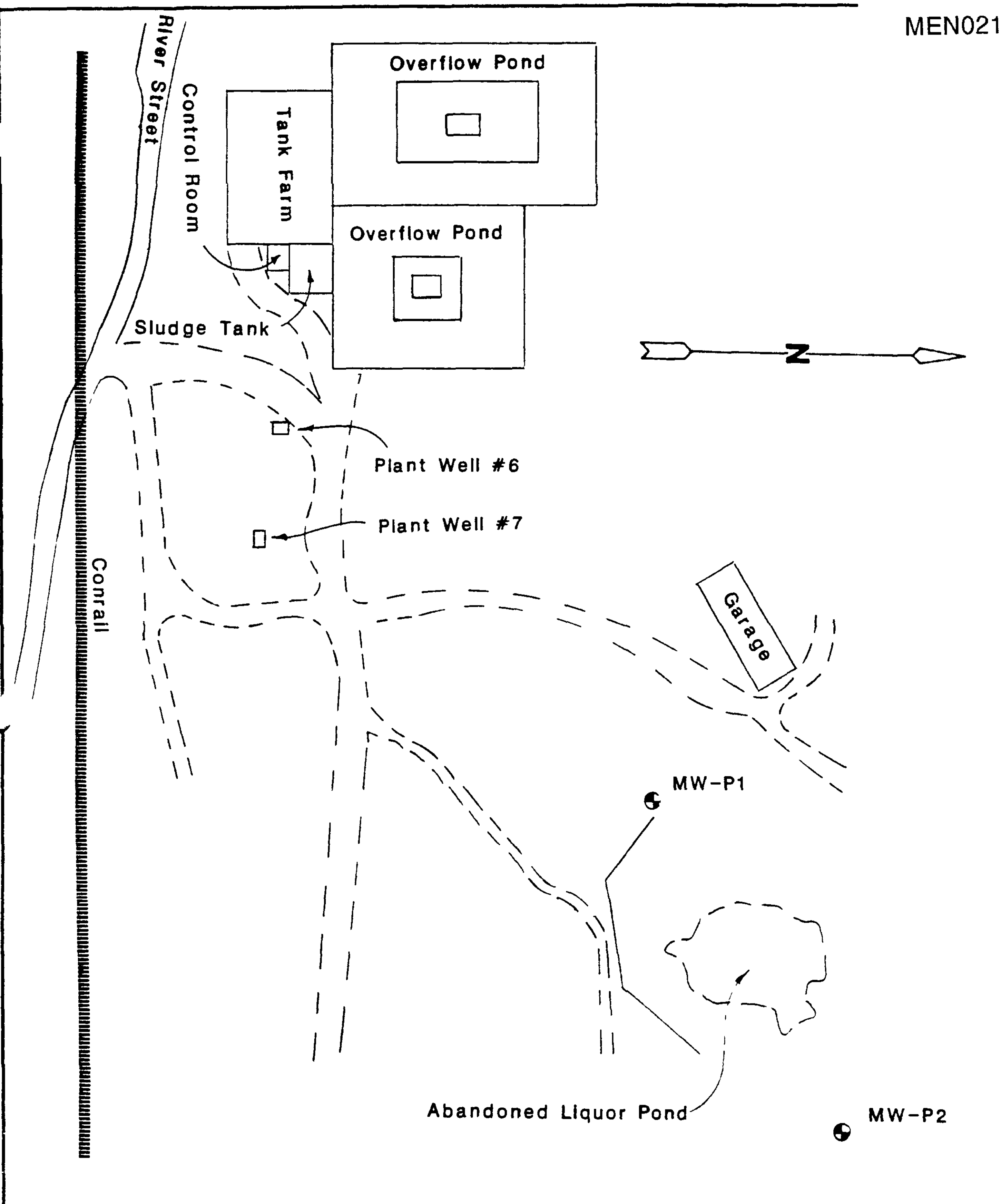
Dianne D. Borrello
Assistant Project Engineer

DDB/cam DKD2#26

STS Project No. 71669XF

Enclosures

MEN02106



STS Consultants Ltd Consulting Engineers	PROJECT/CLIENT MONITORING WELL LOCATION DIAGRAM MENASHA CORPORATION OTSEGO, MICHIGAN	DRAWN BY	DDH	12/87
		CHECKED BY	DDB	12/87
		APPROVED BY	WEH	12/87
		SCALE 1"=134'	FIGURE NO 1	
		STS DRAWING NO	71699 XF	

[illegible]

Sheet 1 of 2

3340 Ranger Road
Lansing, Michigan
(517)321-4967
48906

TECHNICIAN ______ SURFACE ELEV. 728.5'
DRILLER BP BORING STARTED 12-02-87
HELPER CDH BORING COMPLETED ______
RIG NO. B-53 STATION ______
OFF SET ______ CASING USED ______ SIZE ______

WATER LEVEL OBSERVATIONS
WL: 35.5' WS OR WD
WL: ______ BCR ______ ACR
WL: ______ AB ______ Hr. AB
WL: ______ 24 Hr. AB

JOB NO. 71669XF BORING NO. P-1 CLIENT Menasha Corporation WEATHER Cloudy Cold

Sample No.	Depth or Elevation From	Depth or Elevation To	Sampling Method	Penetration Record: Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	DOWNSTREAM POND Sample Description
1	0.0	0.4	SS	3	6	4		0.4		0.4	Topsoil, peat & roots.
1A	0.4	1.5	SS					1.1			Fine-medium sand, trace silt & gravel-brown
	0.0	2.5	HS								
2	2.5	2.8	SS	8	12	13		0.3		2.8	Chalky material-white
2A	2.8	4.0	SS					1.2			Fine-medium sand, trace silt & gravel-brown
	2.5	5.0	HS							4.5±	
3	5.0	6.5	SS	10	19	24		1.5			Fine-coarse sand & gravel-brown
	5.0	7.5	HS								
4	7.5	9.0	SS	9	18	21		1.3			Same
	7.5	10.0	HS							9.5±	
5	10.0	11.5	SS	8	19	22		1.5			Fine-coarse sand & gravel-dark gray
	10.0	15.0	HS								
6	15.0	16.5	SS	10	18	27		1.5			Same
	15.0	20.0	HS							17.0	
7	20.0	21.5	SS	16	31	38		1.5			Fine-medium sand, trace coarse sand & gravel-brown
	20.0	25.0	HS								
8	25.0	26.5	SS	15	37	40		1.5			Fine-coarse sand & gravel-brown
	25.0	30.0	HS								
9	30.0	30.3	SS	17	35	42		0.3			Same
9A	30.3	31.5	SS					1.0		30.3	Fine-coarse sand & fine gravel-black
	30.0	35.0	HS								

ABBREVIATIONS
F.T.-Fish Tail
W.O.-Wash Out
S.T.-Shelby Tube
S.S.-Split Spoon
D.B.-Diamond Bit
P.A.-Power Auger
R.B.-Rock Bit
W.S.-While Sampling
W.D.-While Drilling
B.C.R.-Before Casing Removal
A.C.R.-After Casing Removal
A.B.-After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ______
Fill Thickness ______

CAVE IN LEVEL:
While Drilling and Sampling ______
After Boring Completion ______

WATER LOSS:
At ______ To ______
Percent Loss ______
At ______ To ______
Percent Loss ______

BOULDERS OR OBSTRUCTIONS:
At ______ To ______
At ______ To ______

ARTESIAN PRESSURE:
Depth ______
Height of Soil Rise In Casing ______

MEN02107

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Sheet 2 of 2

TECHNICIAN ______ SURFACE ELEV. 728.5'
DRILLER BP BORING STARTED 12-02-87
HELPER CDH BORING COMPLETED 12-03-87
RIG NO. B-53 STATION ______
OFF SET ______

CASING USED ______ SIZE ______

WATER LEVEL OBSERVATIONS
WL: 35.5' WS OR WD
WL: ______ BCR ______ ACR
WL: ______ AB ______ Hr. AB
WL: ______ 24 Hr. AB

JOB NO. 71669XF BORING NO. P-1 CLIENT Menasha Corporation WEATHER ______

Sample No.	Depth or Elevation From	Depth or Elevation To	Sampling Method	Penetration Record Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
10	35.0	36.5	SS	21	40	62		1.0			Sand & gravel-black-wet
	35.0	40.0	HS								
11	40.0	41.5	SS	25	38	58		1.5			Same (wet)
	40.0	43.0	PB								Washed out with water and set well 43.0'.
	EOB*										*END OF BORING

ABBREVIATIONS
F T - Fish Tail
W O. - Wash Out
S T. - Shelby Tube
S S - Split Spoon
D B - Diamond Bit
P A - Power Auger
R B - Rock Bit
W S - While Sampling
W D - While Drilling
B C R - Before Casing Removal
A C R - After Casing Removal
A B. - After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ______
Fill Thickness ______

CAVE IN LEVEL:
While Drilling and Sampling ______
After Boring Completion ______

WATER LOSS:
At ______ To ______
Percent Loss ______
At ______ To ______
Percent Loss ______

BOULDERS OR OBSTRUCTIONS:
At ______ To ______
At ______ To ______

ARTESIAN PRESSURE:
Depth ______
Height of Soil Rise In Casing ______

MEN02108

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3340 Ranger Road
Lansing, Michigan
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48906

Sheet 1 of 2

TECHNICIAN ______
DRILLER BP
HELPER CDH
RIG NO. B-53

SURFACE ELEV. 740.0'
BORING STARTED 12-03-87
BORING COMPLETED ______
STATION ______
OFF SET ______

CASING USED ______ SIZE ______

WATER LEVEL OBSERVATIONS
WL: 40.5' WS OR WD
WL: ______ BCR ______ ACR
WL: ______ AB ______ Hr. AB
WL: ______ 24 Hr. AB

JOB NO. 71669XF **BORING NO.** P-2 **CLIENT** Menasha Corporation **WEATHER** ______

Sample No.	Depth or Elevation From	Depth or Elevation To	Sampling Method	Penetration Record, Split Spoon Blows 6"	6"	6"	6" (2 Feet)	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
1	0.0	0.2	SS	6	10	16		0.2		0.2	Topsoil
1A	0.2	1.5	SS					1.3			Fine-coarse sand & gravel-brown
	0.0	2.5	HS								
2	2.5	4.0	SS	6	18	13		1.4			Same
	2.5	5.0	HS								
3	5.0	6.5	SS	10	14	14		1.0			Same
	5.0	7.5	HS								
4	7.5	9.0	SS	6	11	15		1.2		7.0	Fine-medium sand, some coarse sand & gravel-brown
	7.5	10.0	HS								
5	10.0	11.5	SS	8	7	5		1.0			Same
	10.0	15.0	HS							14.0	
6	15.0	16.0	SS	11	19	24		1.5			Fine-coarse sand & gravel.
	15.0	20.0	HS								
7	20.0	21.5	SS	13	25	42		1.5			Same (Cobble at bottom)
	20.0	25.0	HS								
8	25.0	26.0	SS	15	26	33		1.0			Same
8A	26.0	26.5	SS					0.3		26.0	Fine silty sand-brown
	25.0	30.0	HS								
9	30.0	31.5	SS	15	21	31		1.3			Fine-medium sand, trace gravel-brown
	30.0	35.0	HS								

ABBREVIATIONS
F.T.-Fish Tail
W.O.-Wash Out
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P.A.-Power Auger
R.B.-Rock Bit
W.S.-While Sampling
W.D.-While Drilling
B.C.R.-Before Casing Removal
A.C.R.-After Casing Removal
A.B.-After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ______
Fill Thickness ______

CAVE IN LEVEL:
While Drilling and Sampling ______
After Boring Completion ______

WATER LOSS:
At ______ To ______
Percent Loss ______
At ______ To ______
Percent Loss ______

BOULDERS OR OBSTRUCTIONS:
At ______ To ______
At ______ To ______

ARTESIAN PRESSURE:
Depth ______
Height of Soil Rise In Casing ______

MEN02109

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3340 Ranger Road
Lansing, Michigan
(517)321-4967
48906

Sheet 2 of 2

TECHNICIAN ______
DRILLER BP
HELPER CDH
RIG NO. B-53

SURFACE ELEV. 740.0'
BORING STARTED 12-03-87
BORING COMPLETED 12-04-87
STATION ______
OFF SET ______

CASING USED ______ SIZE ______

WATER LEVEL OBSERVATIONS
WL: 40.5' WS OR WD
WL: ______ BCR ______ ACR
WL: ______ AB ______ Hr. AB
WL: ______ 24 Hr. AB

JOB NO. 71669XF BORING NO. P-2 CLIENT Menasha Corporation WEATHER ______

Sample No.	Depth or Elevation From	Depth or Elevation To	Sampling Method	Penetration Record – Split Spoon Blows 6"	6"	6"	6"	R Length Recovered in Feet	Qp Penetrometer Test in TSF	Strata Change	Sample Description
10	35.0	36.5	SS	15	32	45		1.3			Fine-medium sand, trace gravel-brown (Same)
	35.0	40.0	HS								
11	40.0	41.5	SS	12	15	27		1.5			Fine-medium sand, trace gravel-brown-wet
	40.0	45.0	HS								
12	45.0	46.5	SS					1.5			Same
	45.0	47.0	HS								
	EOB										

(2 Feet)

ABBREVIATIONS
F.T.-Fish Tail
W.O.-Wash Out
S.T.-Shelby Tube
S.S.-Split Spoon
D.B.-Diamond Bit
P.A.-Power Auger
R.B.-Rock Bit
W.S.-While Sampling
W.D.-While Drilling
B.C.R.-Before Casing Removal
A.C.R.-After Casing Removal
A.B.-After Boring

DRILL CREW CHECK LIST
Topsoil Thickness ______
Fill Thickness ______

CAVE IN LEVEL:
While Drilling and Sampling ______
After Boring Completion ______

WATER LOSS:
At ______ To ______
Percent Loss ______
At ______ To ______
Percent Loss ______

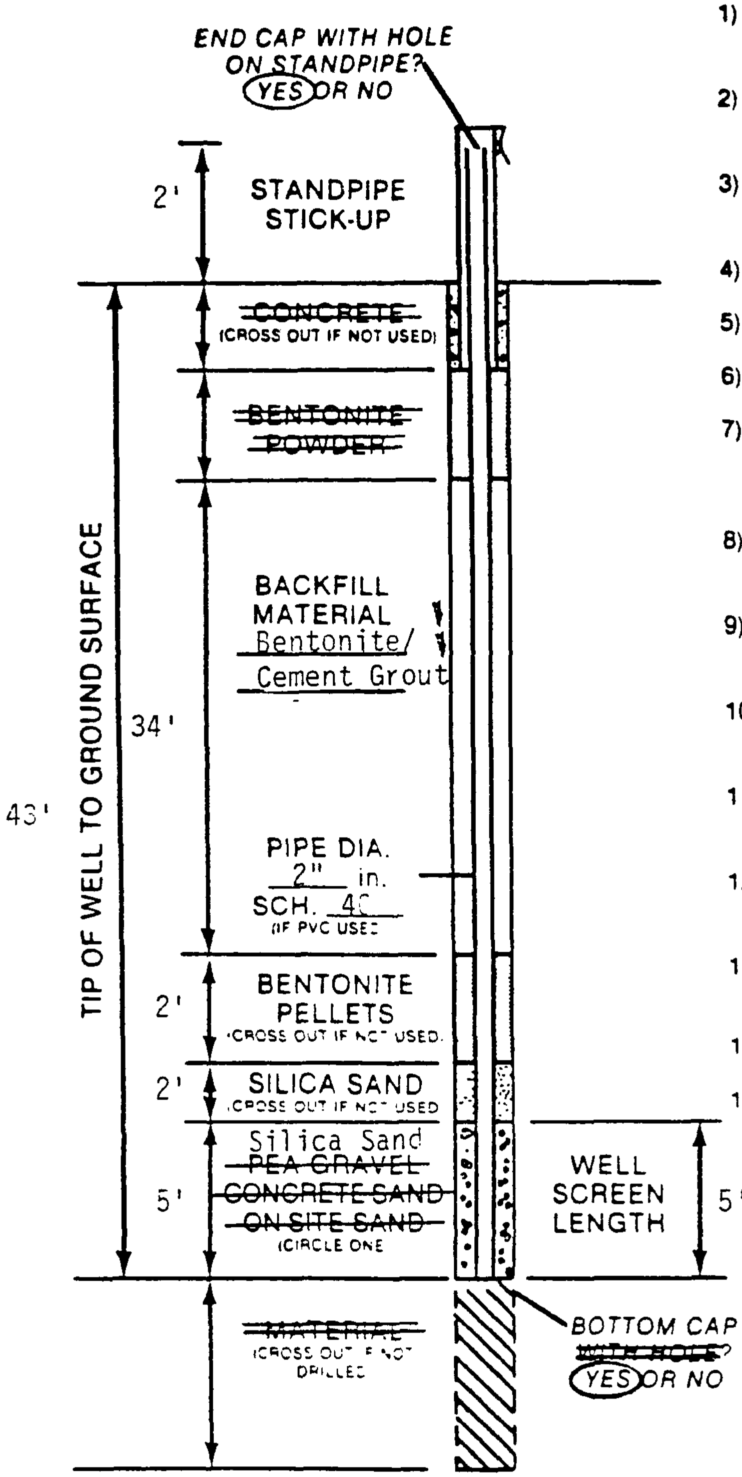
BOULDERS OR OBSTRUCTIONS:
At ______ To ______
At ______ To ______

ARTESIAN PRESSURE:
Depth ______
Height of Soil Rise In Casing ______

MEN02110

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE 10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
~~SOLID~~ AUGER, $\boxed{\text{HOLLOW STEM AUGER,}}$
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER 1.5 hours

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 35 gallons

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
33.2 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE 12-04-87 . 33.2 Ft. FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE

Well No. P-1 DATE INSTALLED 12-03-87 DRILL RIG B-53 DR10

DRILLER Bruce Penfield DRILL CREW Dennis Hickey

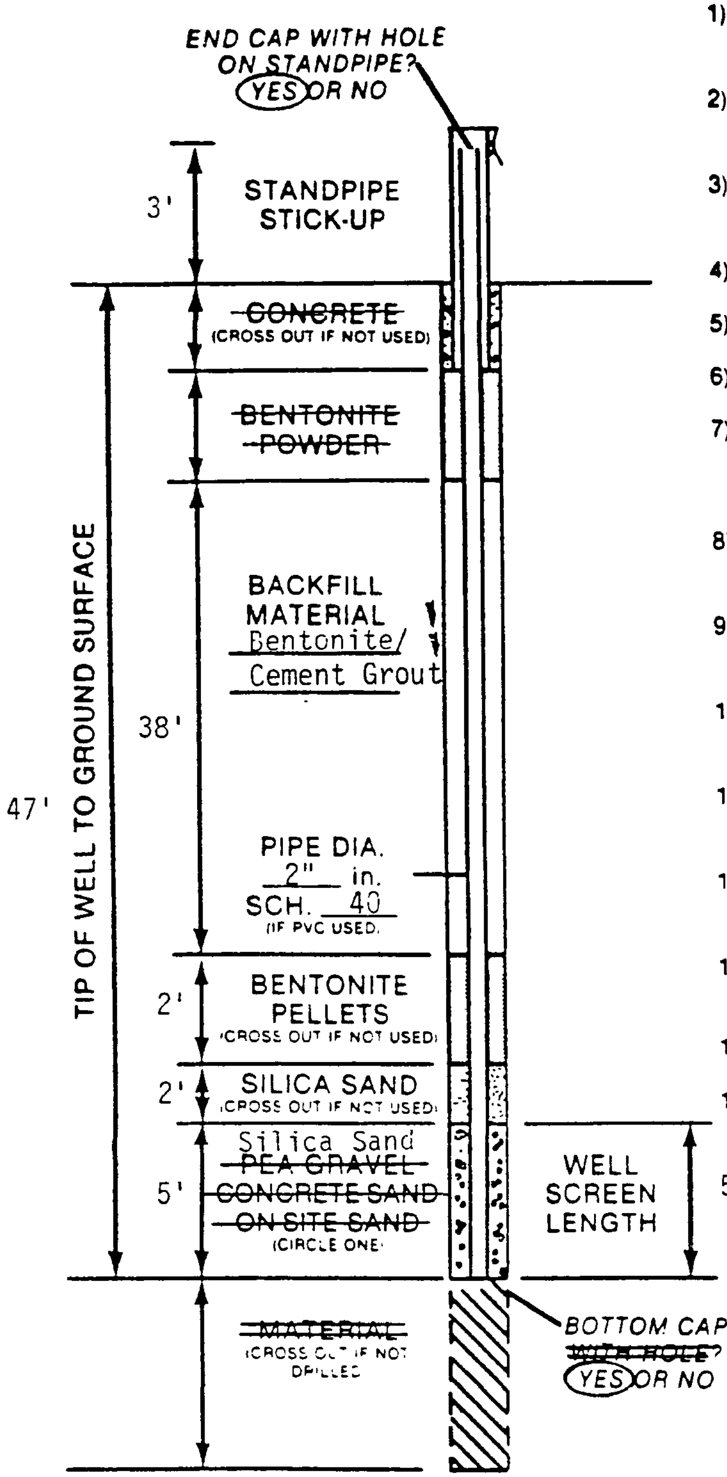
JOB/CLIENT Menasha Corporation STS JOB No. 71669XF

FW 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM

MEN02112



1) TYPE OF PIPE?
PVC, GALVANIZED, STAINLESS, OTHER ______

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, THREADED, OTHER ______

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, STAINLESS, OTHER ______

4) SCREEN SIZE 10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

6) WAS SOLVENT USED? YES OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, $\boxed{\text{HOLLOW STEM AUGER,}}$
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER 1.5 hours

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 35 gallons

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T STANDPIPE AFTER DEVELOPMENT?
38.6 Ft or DRY

2) OTHER MEASUREMENTS

DATE 12-04-87 . 38.6 Ft FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE
DATE ______ . ______ Ft. FROM T. ST. PIPE

Well No. P-2 DATE INSTALLED 12-04-87 DRILL RIG B-53 DR-10

DRILLER Bruce Penfield DRILL CREW Dennis Hickey

JOB/CLIENT Menasha Corporation STS JOB No. 71669XF

FW 1-983

esi

WESTERN MICHIGAN
ENVIRONMENTAL SERVICES, INC.
245 EAST LAKEWOOD BLVD.
HOLLAND, MI 49424-2066
PHONE 616-396-1209

MEN02113

TO: Menasha Corporation
Box 155
Otsego, Michigan 49078

Attn: Gary Roys

DATE: January 12, 1988

ANALYSIS: OF VARIOUS SAMPLES

REPORTED BY: Robert W. Hamm
Robert W. Hamm, Laboratory Director

SAMPLING DATE: Received from client December 15, 1987.

RESULTS: Expressed as milligrams per liter (mg/ℓ) except where noted in parentheses.

ESI #	SAMPLE I.D.	PARAMETER	CONCENTRATION
8712098-1	Sample P#1	pH (s.u.)	7.5
		Odor (OII)	4
		Phenol	0.018
		Tannin & Lignin	103
		TOC	230
-2	Sample P#2	pH (s.u.)	7.4
		Odor (OII)	0
		Phenol	0.012
		Tannin & Lignin	22.8
		TOC	170

Keith

MEN02114

MENASHA CORPORATION
PAPERBOARD GROUP

September 21, 1988

Mr. Arvard Rose
1320 106th Ave.
Otsego, MI. 49078

Dear Bud,

I am writing to address concerns you have expressed with the groundwater supply on Hill Road. Your Son-in-Law, William Thornton, has requested hookup to Otsego's municipal water supply on Hill Road because of a groundwater contamination problem in this area caused by Menasha Corporation in 1973. Otsego has refused the hookup request stating that they will hookup only to houses within the City. I discussed this with City Manager, George Strand on September 12. The City Commissions feeling is that there is a lot of potential for development in the areas surrounding Otsego. If one hookup is allowed, Otsego could find themselves supplying water to many residences which do not pay taxes to the City. Barring a change in City policy, it appears that on-site water is the only other feasible option.

Concerning the water quality in this area, it is Menasha's opinion that the groundwater contamination problem has been resolved. As a long time Menasha employee and area resident , you are familiar with the contamination problem. Waste liquor from our pulping process was put into a ground depression where it eventually migrated to the groundwater, reaching the municipal water supply. Menasha purchased this water supply and has since pumped the two wells at a rate of approximately 1/2 million gallons per day. In addition, in 1985, complete excavation of the ground depression was accomplished. Test wells were installed both above the below the area of concern this year. Tests have shown no traces of phenol, the contaminant of concern.

The area where Mr. Thornton intends to get his water from is upstream of the area where contamination used to exist. This along with the fact that the area has been cleaned up, should mean that phenol in the water supply will not be a concern. In order to insure this I will be happy to send a sample of the water to an independent lab for phenol testing. When the well has been completed, contact me and I will get a sample.

If you have any further questions concerning this matter feel free to call me.

Sincerely,

Otsego Paperboard Division

Keith B. Kling

Keith B. Kling
Environmental Supervisor

cc: John Blauwkamp
John Bonham

/ac

MEN02116

PREIN & NEWHOF, P.C.

ENGINEERS — SURVEYORS — ENVIRONMENTAL & SOILS LABORATORIES

3000 EAST BELTLINE, N E
GRAND RAPIDS, MICHIGAN 49505
TELEPHONE (616) 364-8491
TELECOPIER (616) 364-6955

BRANCH OFFICE
285 JAMES ST , SUITE E
HOLLAND, MICHIGAN 49424
TELEPHONE (616) 399-9218

May 19, 1989
77129L

Mr. John Bonham
Menasha
P O Box 155
Otsego, Mi 49076

Re: Sample rec'd 5/16/89
Dated 5/15/89

LABORATORY RESULTS

Sample	Thorton
Lab Log #	1749
Phenol, mg/L	<0.01

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Laboratory Director

MEN02117

MENASHA CORPORATION
PAPERBOARD GROUP

May 30, 1990

Mr. Galen Kilmer
Michigan Dept. of Natural Resources
621 10th Street
Plainwell, MI. 49080

Dear Mr. Kilmer:

Menasha Corporation, in July 1988, submitted a request for removal of its name from the Final Priority List of the Michigan Environmental Response Act 307. This request was sent to your office to be forwarded to the appropriate officials. After thirteen months we called Lansing to determine if any action had been taken. We were told by Drew Gable that his office could find no record of our delisting petition. The recommendation recently received from Lansing is to resubmit our petition to the District Office. Drew Gable stated that the people at the District Office will decide whether or not to recommend a company for delisting to the Chief in Lansing. I am therefore resubmitting the documents originally submitted on July 21, 1988.

Considering that the site was remediated nearly 5 years ago and our petition for removal was submitted almost 2 years ago, I hope this request will be given a high priority. If you have any questions on this matter please call me.

Sincerely,

Otsego Paperboard Division
Keith B. Kling

Keith B. Kling
Environmental Supervisor

Enclosure

cc: John Bonham
Jim Porter
John Blauwkamp

KBK:amc

OTSEGO MILL • 320 N FARMER STREET • P O BOX 155 • OTSEGO MICHIGAN 49078-0155 • PHONE 616-692-6141

MEN02118

MENASHA CORPORATION
PAPERBOARD GROUP

July 21, 1988

Mr. Galen Kilmer
Michigan Dept. of Natural Resources
621 10th Street
Plainwell, MI. 49080

Dear Mr. Kilmer:

By virtue of this document, Menasha Corporation is formally requesting removal of its name from the Final Priority List of the Michigan Environmental Response Act 307. This document details a brief history of the contamination which caused said listing, and Menasha's clean-up efforts, as well as test results which indicate that no further contamination is occurring from the site in question. We would appreciate your prompt consideration of this request. If you have any questions, please contact me.

Sincerely,

Otsego Paperboard Division

John T. Bonham
Engineering/Technical Services Manager

Enclosures
/ac

Request for Removal From Final Priority List of the Michigan Environmental Response Act 307

Background

In 1973, Menasha Corporation was producing approximately 360 tons per day of corrugating medium, used in the manufacture of cardboard boxes. The pulping process used was the neutral sulfite semi-chemical cook. During pulping, wood chips were digested in a sodium sulfite solution and then pressed to remove the cooking liquor. This spent liquor was highly colored and contained free and combined SO_2, and lignosulfonates. The liquor was concentrated by gas-fired evaporators and stored in two holding ponds until summer months, when it was pumped out and used as road binder on gravel roads in nearby townships

Chronology of Events

Due to an interruption of gas service to the mill, Menasha found itself unable to use the evaporators to concentrate the liquor to a manageable volume. By January 1973, the two holding ponds had reached their capacity of 2.2 million gallons. On January 12, Menasha notified the Water Resources Commission of its intent to use an old gravel pit north of 106th street for emergency storage of black liquor. Based on past experience, it was believed that the liquor solids would seal the bottom of the pond and prevent leaching. On January 15, the Water Resources Commission concurred with this plan, provided that water from the two nearby old city wells was monitored.

Liquor hauling to the emergency storage pond began in approximately mid-March of 1973. Exact dates and quantities are not precisely known due to lack of records from 15 years ago, but based on available information between 1 and 2 million gallons of liquor were placed in the emergency storage pond. At some point in time, it was noticed that the level in the pond was not rising commensurately with the amount of liquor being placed in it. This type of leaching indicated a probable source of groundwater contamination. As the spent liquor incinerator was still in the process of being constructed, the only way to dispose of the liquor was through use as road binder during summer months. The emergency liquor pond was emptied in this fashion during the summers of 1973 and 1974.

In April of 1974, a residence on 106th Street reported the water supply from their well was turning progressively darker. By June of 1975, a total of 6 residence wells and the two nearby city wells showed evidence of groundwater contamination. It was believed that this contamination was due to leaching from the emergency liquor storage pond. To remedy this problem, Menasha first installed activated carbon filters and/or water coolers at the residences, and then paid to have the municipal water supply extended down 106th Street to these homes. Menasha then paid for the installation of a new municipal well, and tied the two old city wells into the mill's process water supply system. The two wells were labelled as Menasha #6 and #7 wells. From 1975 until the present, they have both pumped on a continual basis.

According to contacts at the City of Otsego, there are no city records which indicate the pumping rates from these wells prior to Menasha taking control of them. In speaking with Sam Gowdy, the City Maintenance Supervisor, his recollection is that only one of these wells was in use in the early 1970's, and that the other well was in a standby mode. If this is true, it's obvious that the ability of these wells to capture contaminants from the old emergency liquor storage pond would be significantly reduced, prior to their purchase by Menasha.

There was no further remediation until 1985, when it was discovered that some residual liquor solids were present on the surface of the ground at the old pond site. These were removed in the summer of 1985, and there is currently good vegetative cover over this area.

Current Status

On December 2, 1987, two monitoring wells were installed near the old emergency liquor storage pond. Well MW-P2 was installed roughly north-east of the old pond (see figure 1). Well MW-P1 was installed south-west of the old pond. The direction of groundwater flow has been well established in this area as being from the north-east to the south-west. This was recently reconfirmed by computer modeling of the aquifer done by STS Consultants. As such, the placement of the monitoring wells allows sampling to determine whether contamination of the aquifer is occurring as the groundwater migrates under the old pond. In addition, plant wells #6 and #7 are pumping on a continuous basis, and the old liquor pond lies within their cone of influence. This reinforces the direction of groundwater flow from MW-P2 to MW-P1.

On January 26, ~~1987~~ 1988, samples were obtained from both monitoring wells for analysis. The samples were obtained after each well was bailed three times its volume, and clean protocol was followed. The samples were analyzed for pH, odor, tannin and lignin, TOC, and phenols by GC/MS. The results are shown below, as well as on the attached laboratory report.

	MW-P2	MW-P1
pH	7.2	7.4
Odor	0	0
Tannin & Lignin	31	140
TOC	290	420
phenols	< 5 ug/l	< 5 ug/l

Two other bits of historical data are relevant. In August of 1980, sampling of #6 and #7 process wells showed a phenol concentration of 10 ug/l. Sampling of the same wells in October of 1987 showed less than 3 ug/l, the detection limit.

Discussion

The primary concern with the spent liquor contamination in the groundwater has been the presence of phenolic compounds in small quantities, which are extracted naturally during the wood pulping process. In August of 1980, prior to the clean-up of residual liquor solids in the old pond area, a sample from #6 and #7 wells showed phenols present in a concentration of 10 ug/l. The aquifer beneath the old liquor pond is within the area of influence of these two wells, so this result would be expected. In addition, the water from these two wells was slightly colored from the presence of spent liquor in the groundwater.

In the summer of 1985, the liquor solids were excavated and disposed of at a class II landfill, along with all visibly contaminated soil. Within a few months, the coloration in the water from #6 and #7 wells had disappeared. A retest of the water from these wells in October of 1987 showed a non-detectable level of phenols (less than 3 ug/l). This clearly demonstrates that the clean-up of residual liquor solids and contaminated soil, along with the continual purging of the aquifer through #6 and #7 wells, has resulted in a major improvement in the groundwater quality.

Please note that #6 and #7 wells have been pumping on a continuous basis since Menasha took them over in 1973. These wells supply approximately 1,000,000 gallons per day of process water to the mill. Since the final site clean-up in 1985, more than one billion gallons have been pumped from the affected aquifer. In addition, the aggressive vegetative growth over the old pond area is clear evidence that all of the liquor-tainted soils have been removed, as small concentrations of liquor in the soil will inhibit vegetative growth.

The monitoring wells placed upgradient and dowgradient of the old pond both show non-detectable levels of phenols in the groundwater as of January 1988. This again demonstrates that the primary contaminant of concern has been purged from the aquifer. The two tests which did show an increase from upgradient to downgradient were the TOC test and the tannin and lignin test. The tannin and lignin test was done as an indirect measure of lignosulfonates, for which there is no direct test. Liqnosulfonates are the products resulting from the reaction of lignin and an alkali sulfur compound in the pulping process. The lignin is the glue which holds the wood fibers together, and is the largest organic component of spent cooking liquor. As such, if there is any trace of liquor left in the groundwater, it would be expected to show up in the lignin and tannin tests. Two key points need to be made. First is that liqnosulfonates are not harmful of themselves. They have been used as pellet binders in cattle and chicken feed for many years. Second is that tannin and lignin enter the groundwater naturally through the decay of wood, as evidenced by its presence in the upgradient water sample. The somewhat elevated level of lignin and tannin in the downgradient sample is not an environmental danger, and will continue to be purged from the aquifer by #6 and #7 wells.

The increase in TOC is also a reflection of the lignin content of the respective samples.

Release Potential

The minimal trace of spent liquor remaining in the aquifer as reflected by the tannin and lignin tests cannot migrate off site. Not only is the aquifer in the cone of influence of #6 and #7 wells, but three more mill process wells are positioned downgradient in such a manner that they would intercept any migration from the old pond site. (see figure 2). There are no domestic wells anywhere near the mill site, as all nearby residents are serviced by the municipal water system. In any case, these are not hazardous substances which could cause injury to public health, safety, or welfare. The only substance of concern, phenol, is no longer detectable in the groundwater immediately downgradient of the old pond, so there is no potential for release of any harmful substance to the environment.

Summary

Remediation has been completed on the site which caused the contamination, beginning in 1973. All of the spent liquor was pumped from the pond, liquor solids and contaminated soil were removed and properly disposed of, good vegetative cover was established, and the aquifer has been purged of more than one billion gallons since final clean-up. Tests for degradation of groundwater quality downgradient of the old pond have shown no evidence of phenols, no odor, and virtually no change in pH. There was some pick-up of tannin and lignin across the old pond, but these are naturally occurring substances still present in relatively low levels, and are not harmful to public health. The aquifer is within the area of influence of #6 and #7 wells, which operate continuously, and they are backed up by three other continuously operating mill supply wells which lie downgradient of the pond. Migration off mill property is virtually impossible, and even so there are no residential wells within any reasonable distance from the mill.

Request For Exclusion

Per Act 307, a site of environmental contamination is a location where there is release or potential release of a hazardous substance in a quantity which is or may become injurious to the environment or to public health, safety, or welfare. It is clear from the actions which Menasha has taken that this condition does not exist, for the following reasons.

a. The only hazardous substance ever found in the groundwater is no longer detectable.

b. Those substances which are present in the affected aquifer in small quantities are not injurious to the environment or human health.

c. The aquifer is continually being purged, and there is no potential for release to the environment.

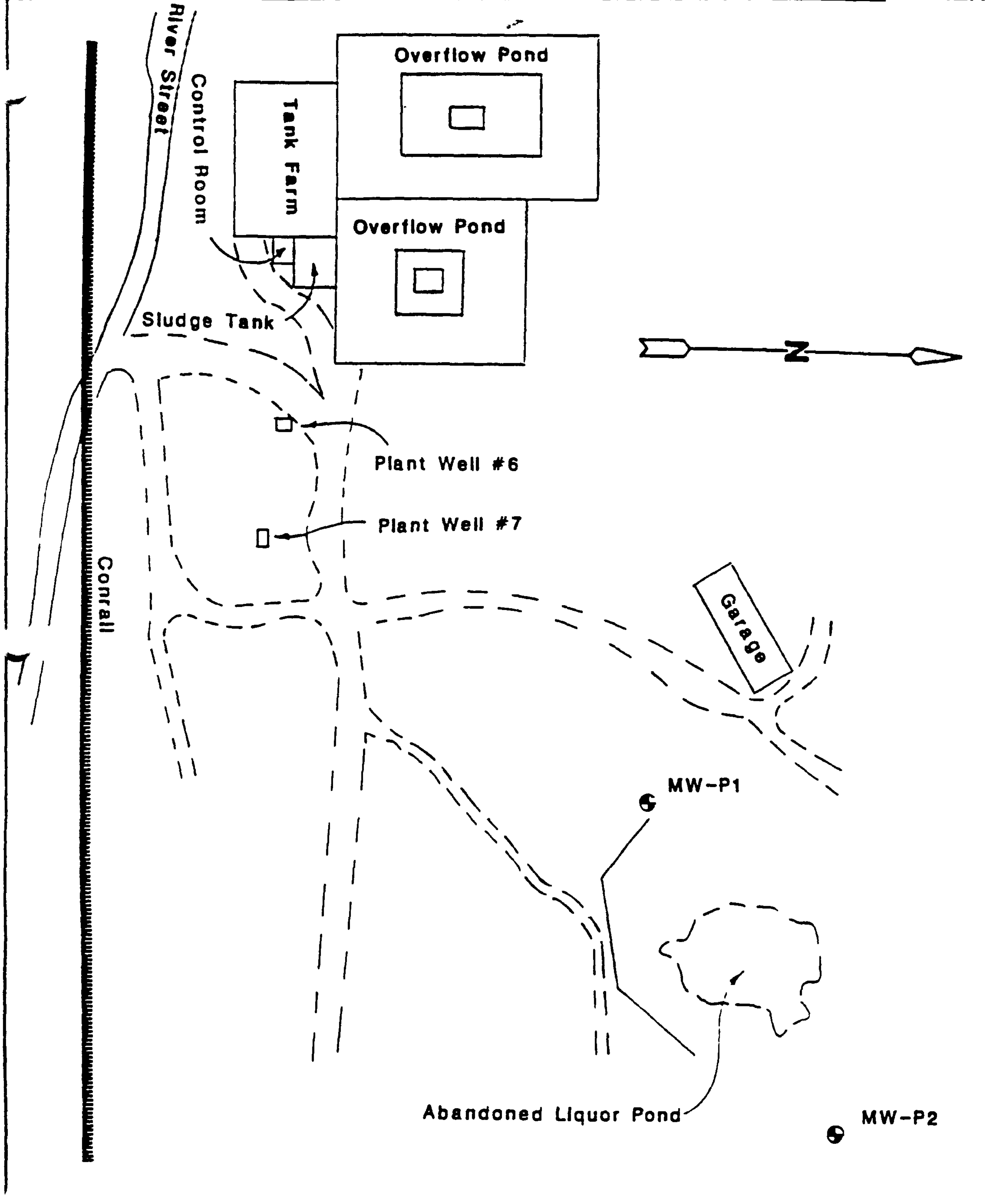
d. There is no downstream point at which human health, safety, or welfare could be adversely affected.

For the reasons outlined in this document, Menasha Corporation hereby requests removal from the Final Priority List pursuant to the Michigan Environmental Response Act 307 of 1982.

/kls
mera307.88

FIGURE 1

MEN02124



PROJECT/CLIENT	DRAWN BY	DDH	12/87
MONITORING WELL LOCATION DIAGRAM	CHECKED BY	DDB	12/87
MENASHA CORPORATION	APPROVED BY	WEH	12/87
	SCALE 1"=134'	FIGURE NO. 1	

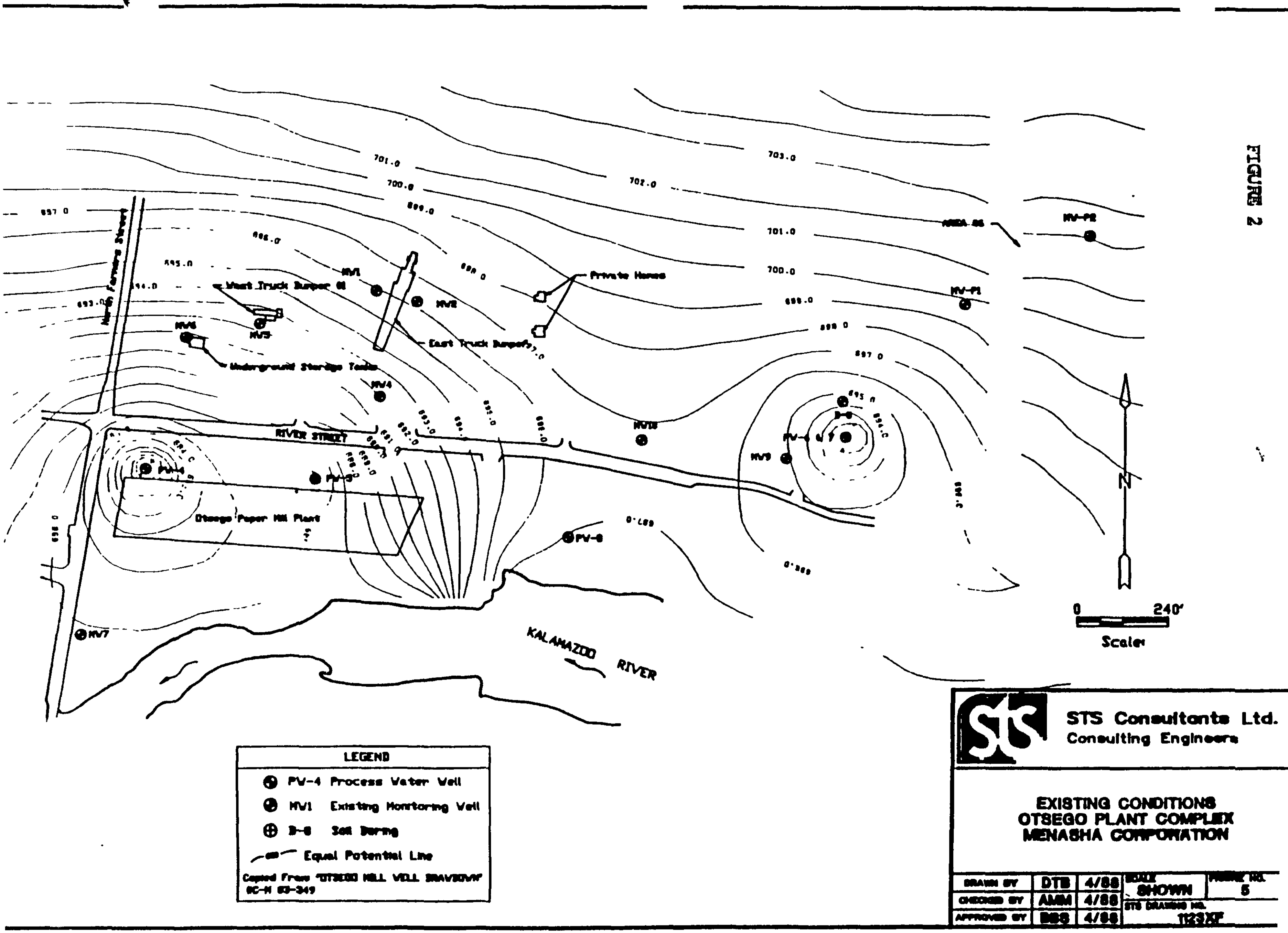


FIGURE 2
703.0
702.0
701.0
700.0
699.0
698.0
697.0
695.0
Private Homes
East Truck Dumper
Underground Storage Tanks
HV1
HV2
HV4
HV5
HV6
HV7
HV9
HV10
HV-P1
HV-P2
PV-4
PV-5
PV-6
B-8
RIVER STREET
Otsego Paper Mill Plant
KALAMAZOO RIVER
0 240'
Scale
LEGEND
PV-4 Process Water Well
HV1 Existing Monitoring Well
B-8 Soil Boring
Equal Potential Line
STS Consultants Ltd.
Consulting Engineers
EXISTING CONDITIONS
OTSEGO PLANT COMPLEX
MENASHA CORPORATION
DRAWN BY DTB 4/88
CHECKED BY AMM 4/88
APPROVED BY 4/88
SCALE SHOWN
FIGURE NO. 5

MEN02125

9TB

WESTERN MICHIGAN
ENVIRONMENTAL SERVICES, INC.
245 EAST LAKEWOOD BLVD.
HOLLAND, MI 49424-2066
PHONE 616-396-1209

MEN02126

TO: Menasha Corporation
Box 155
Otsego, Michigan 49078

Attn: Gary Roys

DATE: February 10, 1988

ANALYSIS: OF LIQUID SAMPLES

REPORTED BY: Robert W. Hamm
Robert W. Hamm, Laboratory Director

SAMPLING DATE: Received from client January 27, 1988.

RESULTS: Expressed as milligrams per liter (mg/ℓ) except where noted in parentheses.

#	SAMPLE I.D.	PARAMETER	CONCENTRATION
8801096-1	West P#1	pH (s.u.)	7.4
		Odor (OII)	0
		Tannin & Lignin	140
		TOC	420
		Phenols by GC/MS	See Attached Table
-2	East P#2	pH (s.u.)	7.2
		Odor (OII)	0
		Tannin & Lignin	31
		TOC	290
		Phenols by GC/MS	See Attached Table

MEN02127

WESTERN MICHIGAN ENVIRONMENTAL SERVICES, INC.

TABLE 1
ACID EXTRACTABLE PRIORITY POLLUTANTS
Results for Menasha Corporation
Received January 27, 1988. Reported February 10, 1988.
Expressed as micrograms per liter (µg/ℓ).
Limit of detection is 5.0 µg/ℓ except where noted in parentheses.

Parameter	West P #1	East P#2
phenol	*	*
2-chlorophenol	*	*
2,4-dichlorophenol	*	*
2,4,6-trichlorophenol	*	*
pentachlorophenol	*	*
4-chloro-3-methylphenol	*	*
2-nitrophenol	*	*
4-nitrophenol	*	*
^ 4-dinitrophenol (50)	*	*
2-methyl-4,6-dinitrophenol (25)	*	*
2,4-dimethylphenol	*	*
ESI #8801096	-1	-2

* = Below Detection Limit

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

DAVID F HALES Director

District 12 Headquarters
P.O. Box 355, Plainwell, Michigan 49080

FYI
John
Jim

MEN02128

August 3, 1990

Keith B. Kling
Environmental Supervisor
Menasha Corporation, Otsego Mill
320 North Farmer Street
P.O. Box 155
Otsego, MI 49078-6141

SUBJECT: 307 Delisting Request

Dear Mr. Kling:

This will acknowledge the receipt of your May 30, 1990 resubmission of a request for Delisting the Menasha plant from the 307 list.

We will present your request to management with a recommendation for Delisting.

If you have any questions please feel free to contact me.

Sincerely,

Galen L. Kilmer

Galen L. Kilmer, Supervisor
ENVIRONMENTAL RESPONSE DIVISION
Plainwell District
616-685-9886

GK:cw

R 1026 1
9/89

SODIUM CARBONATE PILE RECLAIM

DOCUMENT #46

MEN02130

memo / MENASHA CORPORATION

TO: Bob Gulbranson

DATE: 17 April 1981

SUBJECT: Additional Covers for SLI Product Piles

FROM: John Blauwkamp JRB

During the past year we have added four new SLI product piles to those North of River Street. In addition to this, we will add two more large ones before the SLI product crusher is operational. To prevent leaching of soda ash into the ground water, the DNR has required that we cover these piles with an impermeable barrier. The sizes of the plastic covers required and their costs are listed below.

Plastic Covers Required:

1. 90' x 65'	965.25
2. 45' x 35'	259.88
3. 20' x 25'	82.50
4. 20' x 20'	66.00
5. 50' x 60'	495.00
6. 50' x 50'	412.50
	$2,281.13

The total cost of the six pieces of plastic is $2,281.13. Delivery of the plastic covers is two weeks after the order has been placed.

JB/kj

1662

CPM 705
8/78

CAPITAL EXPENDITURE AUTHORIZATION

MEN02131

K. Bonkoski

DIVISION #48 Paperboard	PLANT OR LOCATION Otsego, MI	EA- 180-65 / DATE 1-29-80
PROJECT ADMINISTRATOR R. V. Gulbranson	LIFE OF EQUIP. 5years	EST. COMPL. DATE 3-15-80

PROJECT DESCRIPTION & PURPOSE
Cover stockpile of salt cake with plastic film--as ordered by Michigan DNR to prevent leaching.

DESCRIPTION OF EXPENDITURE	EQUIP. & MATERIAL	LABOR OUTSIDE	LABOR COMPANY	TOTAL
1 piece plastic film 0.006 160 X 160				$2,560
1 piece plastic film 0.006 40 X 80				320
Used Tires to Hold Down				200
Total				$3,080

(Expensed)

APPROVED CAPITAL BUDGET AMOUNT $ Not budgeted
IF SINGLE BUDGET ITEM COVERING MULTIPLE ITEMS, INDICATE BUDGET AMOUNT REMAINING AFTER THIS REQUEST $
(IF EA EXCEEDS CAPITAL BUDGET BY 5% OR MORE, EXPLAIN

ECONOMIC EVALUATION

INVESTMENT	
FIXED ASSETS	
PROJECT EXPENSE	$3,080
WORKING CAPITAL	
TOTAL INVESTMENT	$3,080
BOOK VALUE DISPL. ASSETS (MEMO ONLY)	
PAY-BACK YRS. MONTHS	

CASH PAY-BACK	
PROFIT ON ADDED SALES	
COST REDUCTION OR AVOIDANCE	
LESS: DEPR. ON NEW EQUIPMENT	
PRE-TAX SAVINGS	
50% OF PRE-TAX SAVINGS	
ADD BACK DEPRECIATION	
CASH PAY-BACK	

PREPARED BY:
Russ Fisher /Allan Schenck
REVERSE SIDE OF SHEET FOR SUPPORTING DETAILS ON SAVINGS.

PREPARE ORIGINAL COPY ONLY. ORIGINAL WILL BE FORWARDED TO CONTROLLER AFTER APPROVAL AND WILL BE DISTRIBUTED BY CONTROLLER'S DEPARTMENT PER STANDARD PROCEDURE #1015. IF E. A. IS DISAPPROVED, THE ORIGINAL COPY WILL BE RETURNED IN SAME ROUTING USED IN PREPARATION, BUT IN REVERSE ORDER.

APPROVALS	DATE
~~XXXXX~~ /PLANT ENGINEER Robert V. Gulbranson	1-29-80
DIVISION ACCOUNTANT [illegible]	1-29-80
DIVISION MANAGER [illegible]	[illegible]
VICE PRESIDENT [illegible]	1/31
PRESIDENT [illegible]	2/1

MEN02132

memo / MENASHA CORPORATION

TO: Bruce Buchanan

DATE: 20 July 1981

SUBJECT: Relocation and/or Disposal of SLI Product Piles

FROM: John Blauwkamp JKB

There are two reasons why the SLI product piles must be either relocated or disposed of. The primary reason is that the salt cake piles are currently located in the way of the new liquor and sludge storage tank system. The second reason is that because of the mess the piles are in, we have spent over $7400.00 in the past 10 months for covers and have not been able to keep the piles adequately covered to satisfy the DNR. The piles must be rearranged into one or two large piles so that appropriate cover can be kept on them.

Possible Courses of Action: We have four possible courses of action. 1. We can relocate the existing piles into two new piles. One large pile for carbonate and one large pile for sulfate. The new piles would be located about 200' east of where they are now. After the Labor Day shutdown of this year, we would begin recoverying the soda ash salt cake and reusing it in the digester. After we had completed recovery of the soda ash salt cake, we would begin recovery of the sulfate salt cake. When the SLI was down, the sulfate salt cake would be run through the crushing system and then be sold to a near by kraft mill. The second option is that we could landfill both the carbonate and sulfate salt cake at the Waterveliet landfill. The third option is we could build a new pile for the carbonate salt cake and landfill the sulfate salt cake at the Waterveliet landfill. A fourth option is to build a new soda ash pile and landfill the sulfate in our own landfill. Each of these options has its' own advantages and disadvantages.

Discussion of Alternatives: Table I lists the economics associated with each of the four alternatives. Alternative I involves building two new piles now with the idea of later recovering both the soda ash and the sulfate piles. Breaking up and relocating the salt cake and installing the appropriate cover would cost about $14,000.. The really large cost would be incurred when we started recovering the salt cake. The profitability of recoverimg the soda ash is pretty good. The profit range on this is from $176,000 to $303,000. However, because of its' lower value, the profit range in recovering the SO_4 salt cake is -$70,000 to +$82,000.00. Thisgives a total profit range from $92,000 to $371,000.00. The main uncertainities involved in this option are just how much work it will take to recover the two salt cake piles and if we can find a market for the sulfate salt cake. A variation of this option is that if we find the cost of recovering chemicals (which would be determined first when we recovered soda ash) was more than the value of the sulfate, we could still landfill it at a cost of $25,000.00.

1673

The second option is too landfill all of the material. The two disadvantages of this option are that it would cost $58,000.00 with no potential for profit and it could significantly damage our creditability with the DNR because we have been telling them we intended to recover the material.

The third alternative is to build a new pile for the carbonate salt cake and landfill the sulfate salt cake immediately. This option would cost us $25,000.00 to landfill the sulfate salt cake and another $5,000.00 to relocate the soda ash and install appropriate cover. The cost range for later recovery of the soda ash is from $65,000 to $192,000.00. This gives this option a total cost range of from $95,000. to $222,000.00. This gives option three a total profit range of $146,000 to $273,000.00.

Option four is to build a new soda ash pile and dispose of the sulfate salt cake in our own landfill. The main disadvantage to this alternative is that the DNR considers our landfill to be a Class III landfill and would do everything they could to prevent us from disposing of the sulfate salt cake in our landfill. The second disadvantage is that because of all the special measures we would have to take, it would only cost us about $2,000.00 less to dispose of the material in our landfill than the landfill in Waterveliet. The third disadvantage is that if we dispose of the material in our landfill, the liability for the potential groundwater contamination would be with us forever.

Recommendations: My recommendation is that we excercise option I and build two new salt cake piles. This minimizes the capital expenditures for this year but yet provides for very significant profits from the recovery of the salt cake after the SLI crusher is installed. We are almost certain to make a good profit on recovery of the soda ash salt cake and if things work well, we can make a very good profit on recovery and sale of the sulfate salt cake. If the recovery of the sulfate salt cake proves to be very costly, we can still landfill the material, we will only have spent an additional $9,000.00 more than if we had excercised option III and landfilled the material immediately.

TABLE I

OPTION	COST RANGE	VALUE RANGE	PROFIT RANGE
uild two new piles	$14,000.		(- $14,000.00)
1b Recovery of CO_3	$65,000.- $192,000.	$368,000.00	$176,000.- $303,000.
1c Recovery of SO_4	$38,000.- $150,000.	$80,000.- $120,000.	(-$70,000.- $82,000.)
Total	$117,000.- $356,000.	$448,000.-$488,000.	$92,000. - $371,000.
1d Landfill SO_4 later	$25,000.00		(-$25,000.00)
Total	$104,000.- $231,000.	$368,000.	$137,000. - $264,000.
2 Landfill Both	$58,000.		(-$58,000.)
3a New CO_3 Pile	$5,000.		(-$5,000.)
3b Landfill SO_3	$25,000.		(-$25,000.)
3c Recovery of CO_3	$65,000. - $192,000.	$368,000.	($176,000. - $303,000.)
Total	$95,000. - $222,000.	$368,000.	($146,000. - $273,000.)

1675

MEN02135

MENASHA CORPORATION

20 July 1982

John Cook
3378 Hennesey Road
Watervliet, MI 49098

Dear John;

Several weeks ago, I talked to you about disposing of the unusable portion of our NSSC salt cake and SLI product in your landfill. At that time, you stated that you simply needed a letter stating that these materials were not hazardous waste. We have had both of these materials evaluated by Western Michigan Environmental Services, Inc. of Holland, Michigan. They have found that both of these materials are not hazardous waste. A copy of their report is attached for your records.

Someone else from our company will be contacting you to coordinate when we will begin shipping the material to you and to make the necessary financial arrangements. If you have any questions concerning this material, please feel free to contact me at (616)692-6141.

Sincerely,

Menasha Corporation
Otsego Paperboard Division

John R Blauwkamp P.E.

John R. Blauwkamp, P.E.
Technical Manager

cc: D. Rao
J. DeVisser
L. Phillips
T. Clemmons
B. Buchanan

JB/kj
Attachment

11/41

MEN02136

esi

EVALUATION OF EP TOXICITY STUDY
OF
INCINERATOR WASTES
FOR
MENASHA CORPORATION
OTSEGO, MICHIGAN

WESTERN MICHIGAN ENVIRONMENTAL SERVICES, INC.
ANALYTICAL AND ENVIRONMENTAL LABORATORY
HOLLAND, MICHIGAN

1665

MEN02137

EVALUATION OF EP TOXICITY STUDY
OF
INCINERATOR WASTES
FOR
MENASHA CORPORATION
OTSEGO, MICHIGAN

July 19, 1982

By: Western Michigan Environmental Services, Inc. (ESI)
146 South River Avenue
Holland, Michigan 49423
616-396-1209

1666

PURPOSE

The purpose of this study is to evaluate the incinerator wastes from Menasha Corporation, Otsego, Michigan, to determine the nature of their leachable constituents for waste disposal. This evaluation will define their possible waste classification in accordance with the criteria set forth in the May 19, 1980, Federal Register, Volume 45, Number 98, 40 CFR Part 261.24, Characteristics of EP Toxicity, Appendix II to that subpart, and the Michigan Department of Natural Resources (DNR) Act No. 64 of the Public Acts of 1979.

METHOD AND PARAMETER LIST SELECTION

The method selected was the EP Toxicity Study using the DNR parameters listed in Act No. 64 excluding the pesticide/herbicides.

The method and parameter list were provided to Western Michigan Environmental Services, Inc. (ESI) by John Blauwkamp of Menasha Corporation.

PROCEDURE

The incinerator waste was prepared for analysis by the procedure of the Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, Volume I, Physical/Chemical Methods, May, 1980, pp 7.1-3 to 7.5-6.

The equipment utilized was an EP Toxicity 6 solid waste rotary extractor, operating at 29 rpm for twenty-four hours as specified by the procedure. The samples and deionized water were placed in two-4 liter (one gallon) glass extraction vessels. The pH of each sample adjusted to 5.0 ± 0.2 by addition of 0.5N Acetic acid. After the extraction procedure, deionized water was added to adjust the final volume to twenty times the original sample weight used for each sample. The leachates were then filtered according to the procedure, and prepared for analysis of the parameters listed in the Table of Results.

Standard Procedures for All Aqueous Samples

Solids, all forms	ASTM Method 1888 and Standard Methods Part 208
Cyanide	EPA Method 335.1
Metals, general	ASTM Method D2576 and Standard Methods Part 301A utilizing an Atomic Absorption Spectrophotometer* (dual beam with D_2 background correction)
Arsenic	EPA Method 206.2
Barium	EPA Method 208.2
Cadmium	ASTM Method D3557 and Standard Methods Part 310A
Chromium	ASTM Method D1687 and Standard Methods Part 312A
Copper	ASTM Method D1688 and Standard Methods Part 315B

*Atomic Absorption Spectrophotometers
Jarrell Ash Model 850
Perkin Elmer Model 403

Lead	ASTM Method D3559 and Standard Methods Part 316A
Mercury	EPA Method 245.1 Cold Vapor Procedure
Nickel	ASTM Method D1886 and Standard Methods Part 321A
Selenium	EPA Method 270.2
Silver	Standard Methods Part 324A
Zinc	ASTM Method D1691 and Standard Methods Part 328A

DESCRIPTION

Sample 1, NSSC Salt Cake, consisted of 3" X 2" chunks of pinkish white and brown pieces. They were easily broken into appropriately sized pieces. 126.5 grams and 2024 milliliter of deionized distilled water were placed into the extraction vessel. 506 milliliter of 0.5N Acetic Acid were added. This amount of acid is the maximum allowed by the procedure. The initial pH was 10.8, the final was 9.7. The original sample contained 65.28% total solids, of which 5.99% were volatile, and 94.01% were ash.

Sample 2, SL1 Prod., consisted of 2" X 4" chunks of white, black and brown pieces. The black pieces were harder than the rest of the sample. They were broken into the appropriate size pieces. 127.2 grams and 2035 milliliters of deionized distilled water were placed into the extraction vessel. 509 milliliter of 0.5N Acetic Acid were added. This amount of acid is the maximum allowed by the procedure. The initial pH was 11.0, the final pH was 9.9. The original sample contained 67.13% total solids, of which 0.82% were volatile and 99.18% were ash.

EP TOXICITY - TABLE OF RESULTS

Leachate Concentration
of
Incinerator Wastes
for
Menasha Corporation, Paperboard Division
Otsego, Michigan
July 19, 1982

All results expressed as milligrams per liter (mg/l)

PARAMETER	NSSC Salt Cake	SL1 Prod.	MAXIMUM CONCENTRATION	
			EPA	DNR
Arsenic	0.09	0.12	5.0	5.0
Barium	<1.0	<1.0	100.0	100.0
Cadmium	0.07	0.10	1.0	1.0
Chromium	0.04	0.06	5.0	5.0
Copper	0.12	0.12	---	100.0
Cyanide	<0.5	<0.5	---	20.0
Lead	0.19	0.08	5.0	5.0
Mercury	0.0005	0.0005	0.2	0.2
Nickel	0.20	0.24	20.0	---
Selenium	<0.01	<0.01	1.0	1.0
Silver	0.04	0.06	5.0	5.0
Zinc	0.10	0.12	---	500.0

Original Sample: Results expressed as percent of sample.

Total Solids	65.28	67.13
Volatile Solids	3.91	0.55
Ash	61.37	66.58
ESI # 820658	-1	-2

CONCLUSION

The concentrations of the parameters evaluated have fallen well below the maximum concentration levels set by EPA and DNR for the EP Toxicity Test. Therefore, this report should be submitted to the Michigan Department of Natural Resources, for approval of these waste materials as non-hazardous.

TABLE 1. ANALYSIS OF SALT CAKES
(percent as element in original sample)

Element	Otsego			North Bend		
	Original	Soluble	Residue[d]	Original	Soluble	Residue[d]
Total[a]	-	-	6.76	-	-	10.1
Na[b]	Major	-	Major	Major	-	Major
Na[c]	31.7	29.6	1.93	30.9	26.8	2.62
Ca[b]	0.2	-	Hi	0.4	-	Hi
Ca[c]	0.18	0.01	0.18	0.5	<0.01	0.50
Mg[b]	0.1	-	1.	0.2	-	2.
K[b]	5.	-	1.	5.	-	1.
Al[b]	0.05	-	0.4	0.1	-	0.8
Fe[b]	0.03	-	0.5	0.03	-	0.3
Si[b]	0.03	-	0.2	0.1	-	0.4
Mn[b]	0.01	-	0.[illegible]	0.02	-	0.2
Cr[b]	<0.01	-	0.01	<0.01	-	0.01
Ba[b]	<0.01	-	0.03	0.01	-	0.1
Cu[b]	<0.003	-	0.005	<0.003	-	0.005
Ti[b]	<0.005	-	0.02	0.005	-	0.05
Ni[b]	<0.005	-	0.005	0.005	-	<0.005

(a) Percent of residue in original
(b) Optical emission spectrographic analysis
(c) Atomic absorption analysis
(d) Residue from 1 minute in boiling water (25g/150ml H_2O)

MEN02145

HERRON TESTING LABORATORIES, INC.
CROBAUGH DIVISION
INORGANIC AND ORGANIC ANALYSIS

5405 E. SCHAAF RD.
CLEVELAND, OH 44131
(216) 524-1450

3800 PERKINS AVE.
CLEVELAND, OH 44114
(216) 881-7320

Purchase Order No. 03388
File No. L-357
January 10, 1977

nalysis of Liquor
arked No markings

ent Menasha Corporation Attn: Mr. Bruce Buckanau
Box 155
Otsego, Michigan 49078

ceived at ( ) Schaaf Road Laboratory (X) Perkins Avenue Laboratory on November 17, 1976

ANALYSIS OF LIQUOR

pH	9.3
Total Solids	42.39%
Brookfield Viscosity @ 120°F	60 cps.
Sodium lignosulfonates	8.01%
Total sugars	0.91%
Acetic Acid	6.73%
Total Sulfur	2.40%
Phosphorus	0.008%
Kjeldahl Nitrogen	0.10%
Carbon Dioxide	2.23%
Chloride	0.16%
Zinc	0.001%
Aluminum	0.006%
Barium	0.001%
Boron	0.001%
Calcium	0.05%
Chromium	<0.001%
Copper	<0.001%
Iron	0.01%
Lithium	<0.001%
Magnesium	0.02%
Manganese	0.003%
Potassium	0.17%
Sodium	8.19%

Respectfully submitted,

CROBAUGH DIVISION

Henry R. Friedberg
Technical Administrator

HRF/iad 11 90

MEN02146

CLOW HYDRO RESEARCH SERVICES
Water Management Division
Clow Corporation

Menasha Corporation
320 N. Farmer St.
Otsego, MI 49078
Attn: Mr. Gary Roys

November 14, 1980

P.O. # 21212

Sample received 10-24-80

HYDRO NO:	42944
CUST. ID:	Sodium Carbonate
Solids, Total, %	99.99
Sodium Carbonate, mg/kg	945,000
Sodium, Na, mg/kg	500,000
Sulfur, S, mg/kg	14,200
Phosphorus, Total, P, mg/kg	910
Iron, Fe, mg/kg	280
Barium, Ba, mg/kg	< 2
Strontium, Sr, mg/kg	< 22
Zinc, Zn, mg/kg	30
Vanadium, V, mg/kg	< 6
Nickel, Ni, mg/kg	21
Aluminum, Al, mg/kg	270
Lead, Pb, mg/kg	22
Potassium, K, mg/kg	18,000
Magnesium, Mg, mg/kg	1,100
Calcium, Ca, mg/kg	2,300
Manganese, Mn, mg/kg	340
Copper, Cu, mg/kg	6.6
Silicon, Si, mg/kg	< 56
Titanium, Ti, mg/kg	< 56
Chromium, Total, Cr, mg/kg	1.1
Chloride, Cl, mg/kg	1,590
Boron, B, mg/kg	<100

1691

MEN02147

CLOW HYDRO RESEARCH SERVICES
Water Management Division
Clow Corporation

Menasha Corporation
320 N. Farmer St.
Otsego, MI 49078
Attn: Mr. Gary Roys

November 14, 1980

P.O. # 21212

Sample received 10-24-80

HYDRO NO:	42944
CUST. ID:	Sodium Carbonate
Mercury, Hg, mg/kg	< 0.1
Cadmium, Cd, mg/kg	1.0
Arsenic, As, mg/kg	0.66
Thallium, Tl, mg/kg	< 2
Nitrogen, Kjeldahl, N, mg/kg	< 20
Sulfate, SO_4, mg/kg	42,500
Insoluble matter, %	2.0
PCB, mg/kg	
reported as Aroclor 1242	< 0.1
" 1254	----
" 1260	< 0.1

Results reported on a dry weight basis at 104°C.

Linda Carey
Linda Carey/Manager
Analytical Services

1692

MEN02148

CLOW HYDRO RESEARCH SERVICES
Water Management Division
Clow Corporation

408 Auburn Avenue
Pontiac, MI 48058

313 334-1050
313 334-4747

July 22, 1981

Menasha Corporation
320 North Farmer Street
Otsego, MI 49078
Attn: Mr. Gary Roys

Samples received July 7, 1981.

Hydro number:	I	- 48831 - II
Customer identification:	Salt Cake mg/kg as rec'd	ASTM-A Leachate Procedure on Salt Cake, mg/l*
Sulfate, SO_4,	2,780	820
Carbonate as CO_3	173,000	45,800
pH	--	10.95

*350 grams of sample were leached with 1,400 ml of DI water for 48 hours.

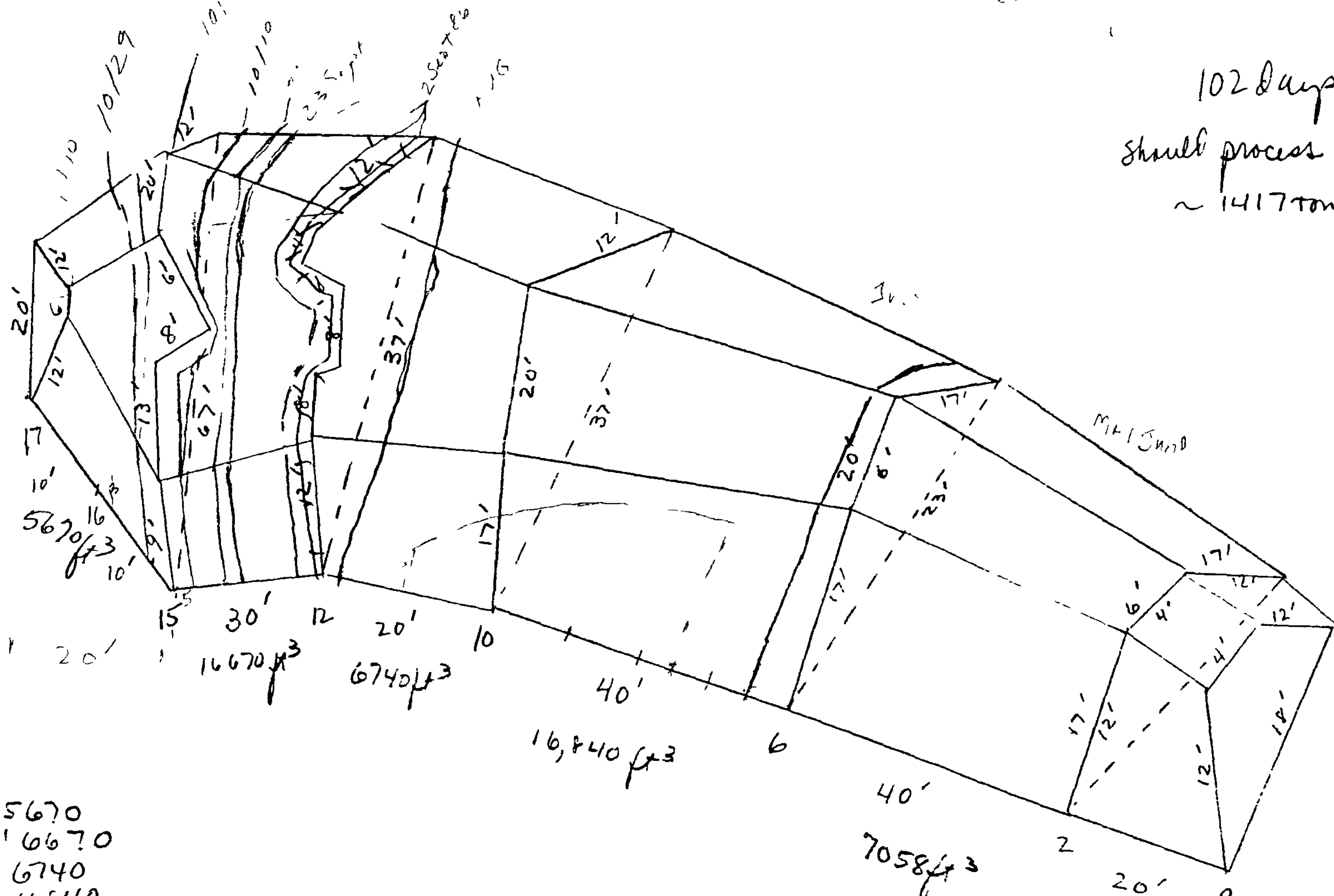
RECEIVED

Linda Deans
Linda Deans
General Laboratory Manager

R 19

1688

102 Days July-Oct
Should process 28917 ft^3
~ 1417 Tons = \$202620



5670
16670
6740
16840
7058
2440
55,418

TOTAL = 55,420 ft^3 of SLI Pdt in pile

of 2 Shifts
~ 7 batches x 1½
10.5 yds or
283.5 ft^3
195 days to proc

@ 1½ YRDS per batch
one shift MAX 4 batches
approx 6 YRDS / DAY
= 162 ft^3 = 342 days where one shift to eliminate pile.

4336 ft^3 of material (Soda Ash) x \$143/TON x 98#/ft^3 ÷ 2000#/TON

ORM 561

MEN02150

memo / MENASHA CORPORATION

TO: Mark Reed

DATE: June 6, 1985

SUBJECT: Revised Plan to Reclaim SLI Product Pile

FROM: Gary Roys

Discussions of the first proposal with Jerry DeVisser and Bruce Buchanan led to the revised plan. The factors that led to this change of scope were:

1. The increase in inorganic (% ash) content of the intermediate probably would increased the cost of burning in the SLI, due to increased oil consumption.
2. Heavy equipment moving on the asphalt lagoon liner would possibly cause damage to the liner.
3. There will be no possibility of liquor going into the lagoon, and
4. The material will be used immediately in the digester, with much easier disposal of any contaminants.

The plan still entails using the tank salvaged from the "bone yard." Hot white water will be piped (by hose) to the tank. SLI product will be added then mixed until desired concentration of soda ash is reached (about 240 - 270 g/l). The tank contents will be settled for 10 - 15 minutes and then pumped to the soda ash mix tank. The digester operator can then pump this material over to the soda ash storage tank.

The tank should be checked for contaminants after each batch, and at least once per day cleaned out.

The material will be hauled from the pile using the front-end loader, or by putting the material on the dump truck and hauling to the site, by the digester. If the front-end loader is used to haul the material to the site, the Bobcat can be used to put the product into the tank.

Work orders have been written to make necessary changes to the tank, and locate equipment.

cc: Jerry DeVisser
Eric Lacy
Joe Curry
Bruce Buchanan
Jim Porter
Mike Carlson
Bill Shepard
Tour Bosses
Steve Rosenthal
Al Coleman

MEN02151

MENASHA CORPORATIO

August 23, 1985

Gaylon Kilmer
Groundwater Quality Division
Department of Natural Resources
P.O. Box 355
Plainwell, MI 49080

Dear Gaylon:

This letter is to confirm our phone conversation of August 23.

In the past year we have had three different Technical Managers, I am the third. During the transition, the sodium carbonate cake management and cake pile elimination project were past on but information regarding the progress report to the DNR due on June 30, 1985 was not.

We have made significant progress and now have a plan and a time table for recovering the sodium carbonate cake piles. I will have the details of the plan and its timetable in a report to you by September 15.

I apologize for missing the date specified in our groundwater permit.

Sincerely,

Menasha Corporation
Otsego Paperboard Division

Mark T. Reed

Mark T. Reed
Technical Manager

cc: J. Blauwkamp
K. Kling
G. Roys
B. Buchanan

kj

OTSEGO PAPERBOARD MILL FARMER STREET • OTSEGO, MICHIGAN 49078 • PHONE 616

MEN02152

MENASHA CORPORATION

August 27, 1985

Ground Water Quality Division
Department of Natural Resources
P.O. Box 355
Plainwell, MI 49080

Gentlemen:

This letter is to inform you of the progress Menasha has made in removing the sodium carbonate salt cake piles.

Earlier this summer several trials were run to test the feasibility of recycling the salt cake piles back into our system. We now have a workable but small scale recovery system.

Because of the size of the system and the in house sodium carbonate inventory concerns, we could have recycled about one third of the pile before this winter.

Our plan is to up-size the recovery system over the winter and have it operational by April 1, 1986. We will run the recovery operation through September. Because of the expected higher mill production rates next summer, in house inventory does not become a concern.

We are now in the process of buying the equipment we need to up-size the recovery system.

If you have any question, please call.

Sincerely,

Menasha Corporation
Otsego Paperboard Division

Mark T. Reed

Mark T. Reed
Technical Manager

cc: B. Buchanan
J. Blauwkamp
G. Roys
K. Kling

kj

OTSEGO PAPERBOARD MILL FARMER STREET • OTSEGO MICHIGAN 49078 • PHONE 616 6

ORM 561

MEN02153

memo / MENASHA CORPORATION

TO: Jim Porter

DATE: April 30, 1986

SUBJECT: SLI Product Recovery

FROM: Gary Roys

The system to recover the SLI product is ready for operation. The operation of this system will require one person per shift on first and second shifts, 7 days per week to start. The heavy equipment operator will deliver 3-4 loads of product first thing in the morning and place it in the east end of the mix tank. More product will be required about mid-first shift, and at the end of the first shift. The heavy equipment operator should also take care not to spill material along the way.

Operation Procedure:

1. Make sure there is product in the tank.
2. Close tank drain vavle.
3. Close discharge on Gorman Rupp pump.
4. Open white water supply valve to tank.
5. Turn seal water on the Allis Chamer mixing pump. Make sure discharge valve for this pump is open.
6. When water level in tank is above the suction to the Allis pump start the recirculation.
7. Fill the tank to just above the top seam with white water.
8. Continue recirculation until a <u>minimum</u> of 180 g/l of soda ash concentration in the tank is achieved.
9. To determine (8) the mix tank operator will test the mix tank concentration using the following procedure:
   i) obtain a sample from the mix tank. and pipet 1 cc into a 250 cc beaker.
   ii) place on a stirrer, place in pH electrode, and titrate with 0.1NHCl to a pH of 4.5. Record number of cc HCl used.
   iii) calculations
   (cc of HCl) x 5.3 = g/l of soda ash.

   This testing should be done after an hour of mixing. Tests should be made every 15 minutes until 180 g/l is achieved. If after two (2) hours the concentration cannot be obtained more product should be added to the tank.
10. When the desired soda ash concentration is achieved, the operator should check the soda ash tank level to determine if there is room in the tank for the chemical. The recirculation pump (Allis Chamer) then shut down, and the tank let set, 10-15 minutes to settle out sand, etc. in the

tank. Then using the Gorman Rupp pump, pump the contents to the soda ash tank. <u>NOTE:</u> During this process if flow through the Gorman Rupp stops, open the strainer flush out for about 2-3 seconds.

When the transfer of the tanks contents is completed, the operator will wait about 10 minutes, then obtain a sample from the soda ash tank for the digester operator to test for carbonate concentration. After testing the digester operator will put the appropriate numbers into the computer.

11. The operator will then clean the screen covering the recirculation pump's suction, and replace.
12. At this time the tank should be refilled with SLI Product, and the above procedure run again.
13. After the second shift operator completes the second batch or if the tank is full of sand and other material other than product, the tank should be drained, and washed out using white water. This may require the operator to get inside the tank and physically remove any of the larger objects such as concrete, sticks, plastics, etc.
14. At the end of the second shift the drain valve should be left open. It is not necessary to open the drain valve at anyother time except for cleaning.

cc: Tour Foreman
M. Reed
K. Kling
F. Katje
T. Oldham
M. Carlson
B. Shepard
D. Hackler

kj

MEN02155

MENASHA CORPORATION
PAPERBOARD GROUP

May 5, 1987

Orchard Hills Landfill
3378 Hennesey Road
Watervliet, MI 49098

Dear Sir:

Please find enclosed the EP Toxicity Study on the SLI product material we disposed of in your landfill in December 1986. We have about 30-40 yards of the same material mixed with concrete, asphalt, bricks, and dirt to dispose of in the landfill.

If you have any questions, please call the writer or John Bonham.

Sincerely,

Otsego Paperboard Division

Gary E. Roys

Gary E. Roys
Process Chemist & Group Leader

/kj

MEN02156

PREIN & NEWHOF, P.C.
ENGINEERS — SURVEYORS
ENVIRONMENTAL & SOILS LABORATORIES
3000 EAST BELT LINE N.E., GRAND RAPIDS, MICHIGAN 49505
255 JAMES STREET, SUITE E, HOLLAND MICHIGAN 49423
TELEPHONE (616) 364-8491
TELEPHONE (616) 399-9218

November 28, 1986
77129

Mr. John Bonham
Menasha Corporation
P O Box 155
Otsego, Michigan 49078

RE: SLIPDT Rec. 111086, received Nov. 11, 1986
EP Toxicity Study

LABORATORY RESULTS

I. EP Toxicity Leachate Concentrations

Final pH	9.6
Arsenic, mg/L	0.020
Barium, mg/L	<0.1
Cadmium, mg/L	0.005
Chromium, mg/L	0.04
Copper, mg/L	0.10
Lead, mg/L	<0.07
Mercury, mg/L	0.0059
Selenium, mg/L	0.018
Silver, mg/L	0.02
Zinc, mg/L	0.187

II. Total Cyanide, mg/L <0.0004

PREIN & NEWHOF

Jane Hoch

Jane Hoch
Chemist

Lab Log #1774
JH:sa

ORM 561

MEN02157

memo / MENASHA CORPORATION

TO: John T. Bonham

DATE: January 6, 1987

SUBJECT: SLI Product Recovery - Final Status

FROM: Gary Roys

The SLI product recovery project began in May 1986 and was completed in December 1986. We recovered about 2500 tons of material, of which about 2000 tons was soda ash. Due to problems with the SLI reactor (high chlorides) possibly caused by the reclamation, the project was stopped November 5, 1986. There was about 150 cu. yds left and this was hauled to Orchard Hills Landfill.

The expenses to process the above SLI product are as follows:

Breaking up of product:	$23,007.72
Transportation to and landfill charges:	2,914.15
Sub total:	$25,921.87
Est. cost of 2 production employees:	25,100.00
Equipment purchased for project:	1,500.00
Est. cost of maintenance labor:	2,000.00
Total Cost:	$54,522.00

Value of SLI Product Reclaimed:

2000 tons @ $83.00/ton:	$166,000.00
2000 tons @ $51.56/ton freight:	103,120.00
Total Savings:	$269,120.00
Net savings to Menasha:	$214,598.00

The project was successful due to the help of many people in maintenance and production departments. Thanks to those for their help.

cc: M. Carlson
J. Porter
B. Buchanan
J. Hall

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